The Problem of Hatchability from the Standpoint of Genetics.

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The death of a large proportion of chick embryos which have begun their development indicates the existence of a very important and interesting problem. It is unnecessary to stress before this audience either the practical urgency or the scientific importance of finding solutions for it. The poultry industry and biological investigation are both suffering from the lack of the answers which even partial solutions might yield.

Like many others, I have been thinking and working on this problem for several years and feel that it is time to draw up a rather sketchy outline of the phases of the problem in which I am chiefly interested and, by adding a few minor observations, to indicate the direction in which the solution may lie.

The problem, reduced to its simplest terms, is to explain the mortality of embryos during incubation. By explanation I mean the finding and interpretation of the causes of in-shell deaths. This is the scientific problem and must precede the important practical problem of applying the experimental conclusions toward the reduction of this mortality, and the consequent raising of the average number of live chickens which may be expected from a given number of eggs.

Up until about fifteen years ago, these two problems, the scientific and the practical one, had but a single approach. Nearly all the attention given to them consisted in experiments on incubation in an attempt to define the optimum and limiting conditions of incubation. The underlying assumption was that the deaths of embryos were caused principally by unfavorable conditions of temperature, humidity, handling of eggs, etc.; or by unfavorable conditions acting on the egg through the mother. The later trend of opinion on this problem was foreshadowed in a relationship which some suspected between the vigor of the sire and dam and the hatchability of their eggs. Such a correlation would signify that not all parents were alike with regard to the hatchability of their eggs. This introduction of individual differences as one basis of variation in hatchability was the first suggestion of a genetic approach to the problem.

Later, when great advances had been made along the first line of investigation, it was found that even under the same conditions individual hens varied greatly in the proportion of their fertile eggs which hatched. The assumption was made that differences in hatching quality were due to inherent differences in the dams and possibly in the sires, and were to some extent independent of environmental conditions. Evidence that this was a valid assumption was furnished by Gowell (1), who by the use of the trapnest and pedigree methods, showed the great variation among hens in the hatchability of their eggs; by Pearl and Surface (2), who measured the variability and produced some evidence that it was inherited; and by Lamson and Card (3), who produced evidence of variability under uniform conditions and concluded that individual differences among hens were the most important cause of variation in hatchability. This second may be called the genetic as distinguished from the environmental approach first considered.

The evidence at present available indicates that the solution of the problem must be sought by both of these methods, since it cannot be doubted that both the environmental conditions surrounding the egg, and the inheritance it receives are potent factors in determining the fate of the embryo. There is no evidence as to how the two are related, since in the present state of our knowledge concerning either set of factors, we are unable to keep one set perfectly constant while varying the other experimentally. There is also the possibility, which still further complicates the problem, that the inheritance

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received is lethal to the embryo only under a particular set of abnormal conditions and that death may be caused by specific combinations of environmental and inherent conditions.

It is evident even now, however, that the environmental factors are much more susceptible of control than are the inherent ones. The experience of many years with artificial incubation has shown roughly the optimum points for temperature, humidity, proportion of carbon dioxide in the air, turning of the eggs during incubation, the best methods for holding eggs prior to incubation, etc. In most cases the lethal limits of variation in these factors of the environment are but imfectly known and it is doubtful if they can be exactly measured until control of the inherent variables is secured. For until it is certain that all of the eggs used in such experiments will react in the same way to normal conditions, it will obviously lead only to approximate conclusions to subject them to abnormal conditions. The absence of such knowledge is not usually a serious obstacle in controlling the environmental conditions surrounding the egg, for with the present development of artificial incubators, it is fairly easy to obtain nearly the optimum conditions.

One other factor which simplifies the control of the environmental factors is the remarkably wide range through which they can be varied without killing the embryos which from their inherited constitution are destined to hatch. Some development of eggs may take place at any temperature between 68° and 106° F. Normally developing eggs may be cooled to as low as 40° for twelve hours at certain periods of development without causing the death of embryos. Last year Professor Lamson and the writer subjected twenty-four fertile eggs on the eighth day of development to a temperature averaging 42.5° F. for thirty-three hours. On the twenty-second day twenty embryos were alive and would probably have hatched if they had been left undisturbed. The same temperature for twelve hours on the tenth to thirteenth days had no apparent effect on the embryos from hens known to produce a high proportion of hatchable eggs, since the cooled eggs hatched normally on the twenty-first day.

Lamson and Edmond (4) have called attention to the wide ranges of variation in environmental factors which are tolerated by the developing embryo. They found that the carbon dioxide and moisture content of the atmosphere of the incubator may be varied considerably without causing an abnormal death rate of embryos.

I have mentioned, thus far, only variation in the external conditions surrounding the egg prior to and during incubation. But environmental factors may act on the egg at any time from or even preceding the formation of the definitive germ cell to its final hatching or death; and there is evidence of a wide range of tolerance of the embryo to factors operating at these times. With regard to such external characters of eggs as weight, character of shell, and the rate at which weight is lost during incubation, the writer has found a great deal of variation in eggs which hatch normally. Only rarely does variation in these factors, which may be regarded as a part of the environment of the developing embryo, become extreme enough to lead to death.

Variations in the environment of the mother before the egg is laid have often been alleged to have an important effect on the hatchability of the egg. Range or the lack of it; heavy or light protein diet, addition of food supplements to the diet and similar nutritional variations have all been considered by one or more investigators as elements affecting hatchability. The effects of such factors must, if they act at all, be indirect, since the effect must be transmitted to the egg through the body of the mother by the alteration of her physiological condition. The envioronment of the egg before laying is the interior of the mother, and this internal environment must of course be altered not only by the factors cited but by many others such as exercise, feeding, egg production, condition of the ductless glands, disease of any of the important organs, etc. The evidence on the relation of nearly all of these factors to hatchability is conflicting; one cannot even generalize to the conclusion that any cause which operates adversely on the mother operates adversely on the egg. In spite of all the ways in which hens are fed and handled, the kinds of eggs they lay, in respect to their physical and chemical constitution, conform closely to an individual

constant. When conditions become so extreme that we might expect them to affect the character of the eggs, the fowl ceases to lay. The act of egg production itself requires that the individual be physiologically normal, and the first indications of abnormality are not the laying of deficient eggs, but the cessation of the act of laying itself. Examples of this are common. The experiments of Wheeler (5) furnish a good illustration. In feeding rations deficient in calcium, he found that the amount of this element, unless replaced by strontium, remained fairly constant in the shell until the amounts stored in the bones were used. After this period was reached, the eggs, instead of containing less calcium, were reduced in number and finally ceased. The fowls, instead of laying shelless eggs, laid none at all. These results have been confirmed by Buckner and Martin (6) for fowls*, and by Riddle and Hanke (7) for doves. It is impossible to say how far these results apply to other constituents of the egg, but it is evident that there exists in the reproductive system of the fowl a regulatory mechanism of the "all or none" type. The whole subject of the relation of such factors to reproduction and particularly to the hatchability of embryos needs investigation. Riddle (8) has pointed the way to an interesting field in his study of the ductless gland relationship existing between the suprarenals and egg production in the dove.

With regard to the effect of previous egg production and reproductive overwork on the hatchability of embryos, the question is in the same unsettled state. A slight negative correlation between previous egg production and hatchability was found by Pearl and Surface (2). Lamson and Card (3), the writer and others have been unable to detect any such relation.

Among the more important environmental causes of variation in hatchability must be listed those conditions which vary with the seasons of the year. Card (9) has obtained good evidence of the effect of the season of hatching on a number of variable traits in chickens, including hatchability. He has kindly allowed me to use certain unpublished parts of this evidence and the data show quite conclusively a seasonal variation in the percent of fertile eggs hatched. The most striking differences are between the high proportions of chicks hatched in May and June (79 and 83 percent) and the low proportion hatched from the same hens in the following January and February (31 and 41 percent). Hatchability in the intervening months July to December did not vary significantly from sixty percent, although fertility showed a marked decrease in the same period. Whether these differences are due to seasonal changes in the reproductive systems of the mothers, to differences in the hereditary nature of the eggs laid in the different seasons or to variation in the external conditions surrounding the eggs before and during incubation I am unable to say. It is even possible that the changing age of the mother may have played some part in causing the decrease. The differences nevertheless are clearly present and may afford an important clue to the environmental factors involved in hatchability. A further indication of this evidence is that season as a cause of variation must be considered carefully in accumulating data on the effect of other variables on hatching quality.

There may be of course many other environmental factors involved such as length of day, use of artificial lights, variation in feeding of the mothers prior to incubation of their eggs, and others. At present I believe we have not the exact information on which to base any opinions on these factors and they are moreover easily controlled or eliminated experimentally.

We are aware now of many of the environmental factors which may be related to hatching quality. The ranges of tolerance of the embryo to many of them are wide, and the optimum conditions are known approximately. Most of the factors listed may be controlled and made fairly uniform and the slight variations which will inevitably occur need not be feared as serious complicating causes of death. With the stage thus set the problem of the genetic causes of variation in hatchability may be attacked with some degree of confidence that these are the only variables. I must not be held to insist that this is the more important approach to the problem, but only that in the present stage of our knowledge it is the more feasible and

*These investigators did, however, find some evidence of thinning of the shells after continued calcium starvation.

may make easier the exact study of the environmental factors at a later time.

For exact information on the inherent causes of death of chick embryos we may search the literature in vain. Data furnished by Pearl (2) appeared to indicate that differences in hatching quality were inherited. This conclusion rests, however, on rather insecure grounds, for Pearl was unable to establish any sensible correlation between the hatchability of the eggs of mother and daughter, and relied on a very slight association between sisters as evidence of inheritance. Breed and strain differences in hatchability probably do exist and should be the subject of further research. There is at present no good evidence that strains differing in hatching quality may be created by selection; although as Lamson and Card(3) showed, individuals so differing may be readily distinguished by testing the eggs of individual mothers. Work on breeding from hens of known hatchability had already been begun by Card when the writer took up this study and for two generations I attempted to separate "high hatch" and "low hatch" lines by selective breeding without success. After the second selection the daughters of the two lines differed by only five per cent in hatching quality of their eggs, although the mothers had differed by over thirty per cent. Possibly I did not persist long enough; but it seemed to me then as now that selection unaccompanied by inbreeding could accomplish little with so complex a character as hatchability; and inbreeding appeared to lead to such a general decrease in hatching quality that it seemed wise to study the effect of inbreeding itself before using it as a method. In spite of this failure it was quite evident that heritable elements were concerned in hatchability, for under inbreeding unaccompanied by selection, I found that families tended to become different in hatching quality. Although hatchability declined in all inbred lines, the amount of decline differed in the different lines, and one family appears to maintain a hatchability of about 50% even into the fourth generation, while others have declined to far below this proportion.

All of these statements deal only with hatchability considered as a general trait or character, as measured by the proportion of embryos which survive the period of incubation. This is a very rough statistical measure and can never yield any indication more useful than the conclusion that some kind of heritable differences are concerned in hatchability. This is, to be sure, a step on the way, but it is certainly not the form in which we wish to obtain our ultimate answer.

The first advance we can make over this is to abandon the concept of hatchability as a single or simple character. However little we may know of it, we do know that it is not simple. All embryos do not die from the same causes. This is evident to all who have dealt with developing eggs. We cannot list more than a fraction of all the probable causes of death, but we do know that under the best incubating conditions variations in egg size, shell texture, relationship of parts within the egg, in the structure of the embryo itself, and probably in many other characteristics of the egg or embryo, may lead to death, and that eggs or embryos which are normal in all except one of these respects encounter the same fate as those which are abnormal in all. It is not necessary to know more than a few causes of death to know that they are numerous and differ in different cases. It would appear then that the logical method of approach is to study separate causes singly wherever that is possible.

Before that is done, however, we must consider the possibility that there is one general underlying cause of which the visible detailed causes are only unimportant concomitants. Such a general cause has often been alluded to as vigor; which is a convenient term often used to mask our ignorance of the real elements contributing to vigor. Personally, I am unable to conceive of vigor in the way in which it is often discussed as something which one individual has and another lacks. Such an idea is repugnant to anyone who has seen single traits separate and recombine in inheritance, and it has been quite definitely disposed of by Wright (10) in his analysis of the extensive inbreeding experiment on guinea pigs which has been carried on since 1906 by the Bureau of Animal Industry at Washington. In the data from over twenty generations of brother by sister inbreeding in several families, and from crosses between the families, Wright finds distinct evidence of the indepen-

dent inheritance of such elements of vigor as fertility, which includes frequency and size of litters; percentage of young born alive, percentage of young raised; birth weight, rate of growth, resistance to tuberculosis, etc. In his conclusions he says, "These elements of vigor have proved to be inherited independently of each other. Each family has come to be characterized by a particular combination of traits, usually involving strength in some respects and weakness in others." This being so, it is plain that vigor is not a general thing but the sum of several distinct and separable traits. Even though we attempt to retreat behind the old concept of vigor as an explanation of differences in hatching quality, we are again forced to face the separate and specific traits of which vigor is composed.

Granted, however, that some measure of vigor in the parents or hatched chickens is available, are we free to assume that the embryos vary in vigor in the same way? And may we say, still using vigor as a sum of a large number of favorable factors, that differences in hatchability are due to differences in the vigor of the embryos? In spite of the current belief that this is so, I believe there are some grounds for asserting that it is not so. I have presented some evidence (11) indicating that hatchability and one element of vigor in the resulting chicks are not related; since there proved to be no correlation between the proportion of embryos (from individual hens) which died during incubation and the proportion of hatched chicks which died in the first three weeks of life. If mortality or survival in the first three weeks after hatching is one measure of vigor then we must conclude that the deaths of embryos were independent of this element of vigor. The same appears to be true of the relationship between hatchability and rate of growth of the chickens, which may be used as an additional measure of vigor. We hope eventually to relate hatching quality to other elements of vigor such as speed of maturity, egg production, longevity, susceptibility to disease and others. At present it appears that the causes of death of embryos are different from the causes of death of young chicks, and are not related to the chief elements of vigor as these may be measured on young or adult birds. I think we have two good reasons then for refusing to believe that vigor is a chief or sufficient explanation for variation in hatching quality; for vigor itself consists of specific elements; and several of these elements have not been found to be related to hatchability.

If we admit that there is no single trait which may be called hatchability, and that a single cause such as differences in vigor cannot explain the survival or death of embryos, we are forced to seek for a number of causes and to study them separately in their relation to hatchability. This will involve a great deal of patient effort, but we may have the consolation of getting definite answers when we get any at all. Each problem may be stated as an alternative question: "Is or is not this particular variable related to hatchability?" Some work on this analysis has already been done; for example the study of the relationship between specific gravity and hatchability of eggs by Mussehl and Halbersleben (12); between weight (13), loss of weight and shell texture (14) on the one hand and hatchability on the other; between previous egg production and hatchability and other similar relationships. These investigations have in general yielded negative results, but they have given us one rather important indication, namely, that the chief causes of embryonic mortality are to be sought not in the external characteristics of the egg, but in the interior or more exactly in the embryo itself.

I have only time enough to suggest a few of the possible causes of death which originate in the embryo itself. For three years I have been opening all eggs which have died in certain experiments between the seventeenth and the twenty-second days of incubation. The embryos have been removed and scrutinized closely; in some cases they have been washed and dissected or preserved for future study. In some three thousand embryos observed, I have found numerous abnormal specimens, in which the abnormality was gross enough to account for the death of the embryo. Such abnormalities are familiar to all of you; embryos with crossed beaks, and one or no eyes at all; embryos with the cranium imperfectly formed so that one or more parts of the brain protrude; abnormalities as extreme as an entirely headless or wingless embryo. I have also

observed a considerable amount of variation in the musculus complexus, or"pipping"muscle on the back of the neck, the contraction of which enables the chick to pip the shell. Pohlman's (15) interesting study of the structure and growth of this important muscle suggests that even slight variations in it might lead to death at the time when the chick normally pips the shell. The occurrence of these abnormalities threw a little light on the problem, but their numbers were few, (about five per cent. of the total embroyos examined), and their distribution was scattering. Finally, however, an abnormality of an entirely different type appeared which had all the earmarks of a specific single inherited trait, and one which spelled death for its possessor. Embryos showing this abnormality I called at first "parrots" from their resemblance to that bird. The most striking feature of the parrot embryos is the altered form of the head and beak. The head is shortened from front to back and the roof of the cranium is raised. The upper beak is shorter by one-half than the normal and is curved downward. The lower beak is about one-third of the normal length and is inserted far under the upper beak as in the birds of prey. The legs are half the length and double the thickness of the normal and are bowed around the abdomen. Such embryos died in the shell between the eighteenth and twenty-first day. These have occurred only in the embryos produced by one mated pair, and practically in the proportion to be expected if this abnormality were due to a single recessive factor. I have observed nineteen normals and five parrots from this mating; the ratio expected on the above assumption being eighteen to six. The normals and the parrots do not intergrade and the parrot abnormality appears to be a specific and easily distinguishable trait. After obtaining these embryos the male of this mating died and the female was mated to his brother. She has now produced by this male thirteen normal chicks; so that it is probable that the second male does not carry the abnormality.

One other case of a cause of death conforming to the usual rules of Mendelian inheritance has already been reported (16). This was a case of complete or nearly complete linkage between the factor for recessive white plumage and a recessive factor which caused the death of embryos pure for it at some time before the sixteenth day of incubation. In matings involving this factor it was found that half of the white chicks expected died early in incubation while the colored ones developed normally.

Both of these factors may be placed in the class of lethal genes, since they cause the death of the embryo which receives them from both parents. Factors with similar effects have been found in the animals and plants which have been most thoroughly investigated genetically viz., the fruit fly Drosophila, the mouse, the corn plant and others. They are always recessive to the normal type, since if dominant, all individuals receiving them, even from one parent, would die and the variation would extinguish itself. They can only be bred in the hybrid or heterozygous condition where the normal mate of the lethal gene is present to keep the individual alive.

It would be presumptuous to generalize from these two cases and say that the inherent causes of death of chick embryos were all to be found in lethal factors. There is, however, other evidence that this may be so. The decline in hatchability under inbreeding is part of this evidence. This decline has been observed by Cole and Halpin and by the writer. Both observers have assumed that the increase of mortality in embryos is due to the recombination of lethal or deleterious recessive factors, since it is known that chance combinations of such factors take place with much greater frequency under close inbreeding than under any other system of mating.

The reverse phenomenon of increase of hatchability under out-crossing has been observed by Pearl and others. This same decrease in mortality and increase in traits favoring survival has been noted in other animals and plants (corn, rats, guinea pigs) and has been explained by Jones as due to the dominance of favorable factors which mask or prevent the expression of lethal or deleterious ones; with the added assumption that individuals and families differ in such favorable factors, one individual or line possessing certain ones which produce the same effect as an altogether different set in another individual or family. All of these factors affecting survival and growth are conceived as specific and separate factors inherited as Mendelian units.

In applying the hypothesis of lethal factors to the problem of hatchability, I am aware that the present evidence is rather slender. Yet in view of the small number of embryos observed, the short period of development from which they were taken, and the limited numbers of blood lines studied, it is not surprising that but two distinct lethals have been found. The detection of lethals depends principally on two circumstances; (1) The observation that the classes of embryos expected from a given mating are not occurring in normal proportions, or that one class is subject to an abnormally high death rate. Before this can be observed, the inheritance of other easily distinguishable traits and the inherited constitution of each sire and dam with regard to each such trait must be known in order that predictions of the numbers of each class of chicks expected can be made accurately. This assumes that the lethal does not produce an easily visible effect, but that it may be identified by its connection (linkage) with other traits which are readily seen, e.g. color, comb form, sex, etc. Such linkages are by no means common. (2) A lethal which does produce a visible effect may be identified by its gross appearance and by its occurrence in some Mendelian proportion. When we consider that the most important organ systems of the body in which lethal variations might take place, such as the circulatory, digestive and respiratory systems or the very important ductless glands, are hidden from view, and that in order to be noticeable on ordinary close inspection a variation in one of the more evident systems such as the nervous system or skeleton, must be very gross indeed, it is easy to see that the chances of observing such variations are likewise very small. The chances are still less that the variation even when found, will prove to be a heritable one, and not due to some accident in development. These remarks apply only to such a superficial inspection as I have used. It cannot be doubted that careful dissection and microscopic examination would reveal many other variations, possibly lethal in nature. Then too in my examination I have sampled only a few of the many periods of development in which death may occur; for I have looked only at those embryos which had developed as far as the seventeenth day. Even in the four day period under observation a large number of gross abnormalities have been found and careful scrutiny of earlier periods might reveal many more.

I wish to conclude this brief sketch with a plea for greater attention to the inherent nature of the embryo itself, for here I believe is one clue to the problem of hatchability. When we study mortality, we should seek for a large part of our evidence in the bodies of the dead just as we obtain our evidence on adult mortality from a post-mortem examination. The embryonic situation with regard to mortality is really much simpler than the adult, for it is seldom complicated by microbic invasion and disease, and the environment may be much more readily stabilized and controlled. Here is a field of research which is almost untouched and full of promise. It should call forth, if properly attacked, all of the resources of the investigator ,and should not only tax, but increase his knowledge of embryology, physiology, anatomy, genetics, and pathology—in fact of all the sciences fundamental to scientific research with poultry.

BIBLIOGRAPHY

(1) Gowell, G. M. Bulletin 93, Maine Agr. Exp. Sta.
(2) Pearl, R. and Surface, F. M. Bulletin 168, Maine Agr. Exp. Sta.
(3) Lamson, G. H. and Card, L. E. 1920, Bulletin 105, Storrs Agr. Exp. Sta.
(4) Lamson, G. H. and Edmond, H. D. 1914 Bulletin 76 and
Lamson, G. H., and Kirkpatrick, W. F. 1918 Bulletin 95 Storrs Agr. Exp. Sta.
(5) Wheeler, W. P. 1919 Bulletin 468, New York Agr. Exp. Sta.
(6) Buckner, G. D. and Martin, J. H. 1920 Jour. Biol. Chem. Vol. 41, pp. 195-203.
(7) Riddle, O. and Hanke, M. C. E. 1921 Amer. Jour. Physiol. Vol. 57, pp. 264-274.
(8) Riddle, O. 1922 Proc. Soc. Exp. Biol. and Med. Vol. 19, pp. 280-282.
(9) Card, L. E. Unpublished data.
(10) Wright, S. 1922 Bulletins 1090 and 1121, U. S. Dept. Agr.
(11) Dunn, L. C. 1921 Poultry Science Vol. 1, pp. 34-38.
(12) Mussehl, F. E. and Halbersleben, D. L. 1923 Jour. Agr. Res. Vol. 23, pp. 717-720.
(13) Dunn, L. C. 1922 Bulletin 109, Storrs Agr. Exp Sta.
(14) Dunn, L. C. 1922 Poultry Science, Vol. 2, pp. 45-48. 1923 Poultry Science Vol. 2, pp. 166-171. 1923 Papers in press.
(15) Pohlman, A. G. 1919 Anat. Rec. Vol. 17.
(16) Dunn, L.C 1923 Amer. Naturalist, in press.

Organization of Poultry Extension in Pennsylvania

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Extension work in Pennsylvania is organized on the principle that subject matter is the foundation upon which the whole structure must be built, both as applied to production and distribution. If poultry is an important industry in a county and the people wish to develop it, the specialist and county agent are a part of one piece of machinery which works towards such development. The specialist in charge of poultry extension is the leader of poultry work in the state. He outlines the various steps which may be taken for improvement, providing a state-wide skeleton plan into which each county or community may fit its detailed operation. This skeleton plan is written up in project form. A copy of each project is supplied to all county agents. Once a year these projects are discussed at the annual meeting of county agents and specialists. Any changes for the good of the work are made at this time. This method keeps all county agents acquainted with the poultry work.

When several specialists are engaged in the same line of work, it has been found that the best results are obtained if one man follows a project through in a community. With this in mind our sixty-six counties have been divided into three sections. A poultry specialist is assigned to each section and he does the greater part of the work in that section.

When culling was made the main piece of extension work, we found that during the summer months we could not begin to accommodate the demand for work in the field, while in the winter we spent too much time in the office. Our projects are now arranged so that the field work is more uniformly distributed. Following is the distribution of work of the poultry specialists in Pennsylvania for the past two years. We try to spend one-third of our time in the office answering correspondence, writing articles and reading up on subject matter.

DISTRIBUTION OF POULTRY SPECIALISTS' TIME IN PENNSYLVANIA.

	MUNROE			STEELMAN			SANFORD			GRAY		
1921	Office	Field	Total	Office	Field	Total	Office	Field	Total	Office	Field	Total
Jan.	11	15	26	4	22	26				9	17	26
Feb.	9	15	24	17	7	24				5	19	24
Mar. ...	8	19	27	5	22	27				6	21	27
Apr.	15	11	26	4	22	26	10	16	26	17	9	26
May ...	21	5	26	7	19	26	11	15	26	14	12	26
June ...	18	8	26	17	8	25	12	14	26	11	11	22
July ...	17	9	26	½	25½	26	2	24	26	1	25	26
Aug. ...	3	18	21	1	26	27	2½	24½	27	1½	25½	27
Sept. ..	6½	19½	26	3½	22½	26	2½	23½	26	1½	24½	26
Oct.	12	14	26	5	21	26	7	19	26	5	21	26
Nov.	9	17	26	1	23	24	3½	22½	26	4	22	26
Dec.	6	21	27	9	3	12	1	16	17	4	17	21
Total ...	135½	171½	307	74	221	295	51½	174½	226	79	224	303
Percentage	44	56		25	75		23	77		26	74	
Av.	30%	70%										

	MUNROE			STEELMAN			SANFORD			GRAY		
1922	Office	Field	Total	Office	Field	Total	Office	Field	Total	Office	Field	Total
Jan.	16	10	26	9	17	26	10	16	26	10	16	26
Feb.	7	18	25	3	21	24	0	8	8	2	22	24
Mar. ...	4	23	27	2	25	27	8	19	27	3	24	27
Apr.	16	9	25	4	21	25	1	18	19	5	20	25
May	2	0	2	2	8	10	18	8	26	5	10	15
June ...	13	13	26	4	10	14	13	6	19	8	14	22
July	7	19	26	4	22	26	5	16	21	4	22	26
Aug.	6	21	27	2	25	27	3	24	27	3	24	27
Sept. ...	10	15	25	7	19	26	7	19	26	2	24	26
Oct.	11	15	26	2	24	26	8	17	25	7	19	26
Nov.	3	22	25	0	25	25	4	21	25	3	22	25
Dec. ...	14	11	25	4	21	25	7	13	20	7	13	20
Total ..	109	176	285	43	238	281	84	185	269	59	230	289
Percentage	38	62		15	85		32	68		20	80	
Av.	26%	74%										

Most of the poultry in Pennsylvania is found in the farm flocks and is uniformly distributed over the state. The commercial flocks are comparatively few and scattered. Up to the last few years poultry has been considered a "necessary evil" on the farm; given very little care and feed, and the income from the flocks was small. The farmers are just beginning to realize the importance of poultry as a means of marketing their grain in the form of eggs and meat. It is the work of the poultry specialists to teach and demonstrate to the farmers the most efficient methods of handling a flock under farm conditions and utilizing their grains as poultry feed.

Believing that farm poultry is the most efficient means of producing eggs and poultry meat, our goal is to have a flock on every farm in proportion to the other activities of the farm and make that flock profitable. Our immediate work is to teach economical feeding, culling, sanitation, good management and the value of keeping a poultry account.

Demonstration flocks are used as a means of teaching better methods of poultry production. Three or more farms in a county are selected in different communities and are known as poultry demonstration farms. The owners are appointed as local leaders in poultry work. As local leaders they assist in advertising the demonstrations and in encouraging the community to use better methods in handling the farm flock. All meetings and demonstrations are conducted on or in the vicinity of these farms. Three meetings are held each year for two years. The cooperator keeps an account of his flock and this record is used to prove that the methods used are profitable. Demonstrations are given in culling, caponizing, rearing chick methods, egg grading, packing, etc.

In our work with the large commercial flock, the cost of producing a dozen eggs each month is discussed and more efficient methods brought out by this discussion. The results of the work with these poultrymen are used to demonstrate the efficiency of different methods of poultry management.

A phase dealing with the selection of breeders is included in several counties. In one county the work has gone beyond the demonstration stage and an association has been organized to conduct this work. Cockerel consignment sales are being encouraged to help distribute the best cockerels from the carefully selected breeders.

As a measure of the results of our work we have the records of the poultry cooperators and a record of farm contacts.

Our records show that four years ago there were 56 complete records from demonstration flocks which had an average production per bird of 120.2 eggs per year. One hundred and thirty-eight complete records last year on 32,095 hens showed an average production of 142.7 eggs. Records on cull-

ing demonstrations show for 1920 thirty-two per cent. of all hens examined by the specialists were culls, while in 1921 eighteen per cent were discarded and in 1922 only twelve per cent. were taken out.

It is difficult to find a basis for definitely measuring the results of Extension Service. In Pennsylvania a great deal of thought has been given to this question and a unit of measure has been worked out. As a result of much discussion and observation, a scale of "farm contact factors" has been developed so that every piece of work could be measured in terms of the number of farms definitely reached by each project. The following scale has been used:

Table of Farm Contacts and Equivalents

5 for each of the following and 1 for each member: Boys' and Girls' Club. Adult Poultry Club.

7 for each management farm.

5 for each judging contest conducted and 1 for every 5 contestants.

5 for each show judged.

1 for each culling or similar demonstration and 1 for every 10 in attendance.

1 for every 10 persons attending a feeding or rearing chick meeting.

1 for each farm on which purebreds are introduced.

1 for each farm assisted in disposing of purebreds.

1 for each farm keeping cost records.

1 for each association formed and 1 for every five members.

1 for each miscellaneous meeting addressed.

The results of our work in 1922 on the above basis is as follows:

No.			Meetings			
Dem.	Project	Farms	No.	Att.	Members	Contacts
276	Management Farms					1834
5	Breeding Work	91				131
	Illumination Dem.	8				8
	Assist. Illum.	56				56
5	Poultry House Dem. ...		1	30		24
	Assist. Housing	605				605
521	Culling Dem.		144	12,496		1855
17	Feeding Meetings	6	221	4,763		589
	Rearing Chick Meet. ..	66	197	5,325		584
68	Select. Breed. Dem.		74	862		189
21	Caponizing Dem.		5	332		54
	Flocks Culled for	192				192
	Other Accounts Kept. ..	161				161
23	Poultry Clubs		6	3,165	134	346
	Pedigreed Eggs intro. ..	11				11
108	Cockerels intro.	71				71
5	Assns. Org. 1922				148	41
6	Adult Poultry Assns.....		3	44	144	76
6	Misc. Dem.		6	224		34
	Misc. Meetings	176	176	4,508		254
30	F. B. Poultry Shows				1385 ent.	201
37	Judg. at fairs, etc.					220
11	Judging Contests				160 Con.	97
13	Auto Tours			1,217		205
	Misc. Help	1951				1951
3	Judging Teams					18
	Misc. Meetings	22	12	525		75
					Total	9882

Winter Egg Production on New Jersey Farms.

W. H. ALLEN

New Brunswick, N.J.

Before a sound extension program can be outlined and planned with the object of developing the winter phase of economic egg production in New Jersey, a thorough knowledge must first be had of the present production during this season and the conditions under which it is made.

With this in mind the following studies were made. The data included in the discussion of this paper have been taken from egg record reports of the New Jersey Farm Egg Laying Contest. The records consist of the egg production of the first six months of the present contest, namely, November and December 1922, and January, February, March and April, 1923.

The records are gathered in the following manner. The contestant keeps an accurate count of the number of birds at the beginning of each month, also of any addition or reduction of birds that might occur during the month. The contestant also marks down from day to day the egg production of the flock. These daily records are kept on a calendar which is provided the contestant by the poultry department of the extension division and is one of the features of the Farm Egg Laying Contest. At the end of the month the daily production is totaled and divided by the average number of birds kept for the month. This gives the average egg production per bird for the month.

The average number of birds for the month, total number of eggs for the month, and the average number of eggs per bird is stated on a postal card which is detached from the calendar and sent to the Poultry Specialist's office. At this office the records are checked over and then recorded in a loose leaf note book kept for the purpose. There are over 600 poultry keepers in New Jersey keeping these records but only the records of 244 contestants were used because of the incompleteness of records in the other cases.

The data represent every condition of New Jersey poultry keeping, large, medium and small flocks; every section of every county, the production from pullets and from hens, as well as every type of housing, feeding and management. Many different breeds are represented in these figures but as would be expected the Single Comb White Leghorn predominates.

The 244 farm records are made up of 147 farms keeping both hens and pullets, 84 keeping just pullets and 13 keeping only hens.

There were 109,681 birds reported at the beginning of the Contest by the 244 contestants. 77,298 of the birds were pullets and 32, 383 were hens. At the end of the six months' period there were only 97,392 birds reported, 69,119 being pullets and 28,273 hens. This reduction is due to culling and mortality.

TABLE NO 1.
No. of Birds—244 Flocks

Month	Total No. Birds	No. Pullets	No. Hens
November	109,681	77,298	32,383
December	107,831	76,226	31,605
January	106,009	74,640	31,369
February	103,974	73,117	30,857
March	101,136	71,740	29,396
April	97,392	69,119	28,273
Total	626,023	442,140	183,883

The flocks consisted of an average of 449 birds, of which 316 were pullets and 133 were hens. As the hens and pullets were in all cases housed separately, their records were reported separately.

Another feature of the Farm Egg Laying Contest is the monthly standard or guide which is based upon the egg production results of the Vineland and Bergen County Egg Laying and Breeding Contests. The object in adding this feature to the contest is to give the contestants a guide each month to compare their production.

The standard calls for a production per bird of 8 eggs in November, 10 eggs in December, 10 eggs in January, 12 eggs in February, 19 eggs in March and 21 eggs in April, a total of 80 eggs per bird for these six months.

FLOCK PRODUCTION.

The average flock made a production of 65.2 eggs per bird, which is a production of 36.1% for the period, 14.8 eggs per bird or 18.5% less than the standard calls for. This was due largely to the fact that nearly 30% of the flock is made up of hens and that many of the pullet flocks were immature and not laying heavily until after the Contest was well under way.

TABLE NO. 2.

Flock Production—244 Flocks.

Month	No. Birds	No. Eggs	Eggs per Bird
November	109,681	594,529	5.4
December	107,831	807,912	7.4
January	106,009	1,021,564	9.6
February	103,974	1,091,849	10.5
March	101,136	1,610,008	15.9
April	97,392	1,605,562	16.4
Total	104,337	6,731,424	65.2

TABLE NO. 3.

Egg Production Comparison—244 Flocks

Month	Standard	All Birds	Pullets	Hens
November	8	5.4	6.9	1.7
December	10	7.4	9.5	2.5
January	10	9.6	11.2	5.6
February	12	10.5	11.4	8.1
March	19	15.9	16.4	14.6
April	21	16.4	16.5	16.3
Total	80	65.2	71.9	48.8

TABLE NO. 4.

Per cent. Production Comparison—244 Flocks

Month	Standard	All Birds	Pullets	Hens
November	26.6	18.0	23.1	6.0
December	32.2	24.1	30.7	8.2
January	32.2	31.0	36.4	18.3
February	42.8	37.5	41.0	29.1
March	61.2	51.3	53.0	47.2
April	70.0	54.9	55.1	54.3
Total	44.1	36.1	39.9	27.2

HEN PRODUCTION.

The average flock of hens made a total production of 48.8 eggs per bird from November 1 to April 30, which in other words is 27.2% production for this season, 31.2 eggs or nearly 39% less production than the standard. During no month did they come near making the production the guide calls for. This, of course, is due largely to the fact that the hens are moulting during these months and are not being pushed to production by the owners, as in most cases they are kept first for breeders. The production of the hen flocks were 1.7 eggs per bird for November, 2.5 eggs for December, 5.6 eggs for January, 8.1 eggs for February, 14.6 eggs for March and 14.3 eggs for April, a total of 48.8 eggs per bird for the period.

TABLE NO. 5.

Hen Production—158 Flocks.

Month	No. Hens	No. Eggs	Eggs per Hen
November	32,383	57,098	1.7
December	31,605	81,102	2.5
January	31,369	178,661	5.6
February	30,857	251,555	8.1
March	29,396	431,020	14.6
April	28,273	461,094	16.3
Total	30,647	1,460,530	48.8

PULLET PRODUCTION.

The pullet flocks averaged to lay 6.9 eggs per bird for November, 9.5 eggs for December, 11.2 eggs for January, 11.4 eggs for February, 16.4 eggs for March and 16.5 eggs for April, a total of 71.9 eggs per bird for the period. This is 8.1 eggs less than the standard called for. Only one month, January, did the pullets equal the standard and this month they outlaid it by 1.2 eggs. The production of the pullets as a whole is very good and shows that in New Jersey every factor is favorable to a good winter production if a good strain of birds is kept and proper methods of management followed. In studying the pullet flock records that made up these figures, it was interesting to note that good early winter production can be obtained. In fact, many of the large commercial flocks bettered the standard during these months. During the months of February, March and April, however, it is much harder for the pullets to average as high

as the standard. It is the writer's opinion after inspecting many of these flocks that poor early winter production is due to late hatching and poor spring production to the flock getting thin under the heavy production, short days, and cold weather of winter.

TABLE NO. 6.
Pullet Production—232 Flocks.

Month	No. Pullets	No. Eggs	Eggs per Pullet
November	77,298	537,431	6.9
December	76,226	726,810	9.5
January	74,640	842,903	11.2
February	73,117	840,294	11.4
March	71,740	1,178,988	16.4
April	69,119	1,144,468	16.5
Total	73,690	5,270,894	71.9

WHITE LEGHORN PULLET PRODUCTION

It was impossible from the data at hand to make a thorough study of winter egg production from a breed standpoint other than from the Single Comb White Leghorn pullets. The records making up the following table were taken from 125 farms. The average production for them was 73.3 eggs per bird for the six months, 7.2 eggs for November, 10.2 eggs for December, 11.4 eggs for January, 11.4 eggs for February, 16.6 eggs for March, 16.5 eggs for April, making a total of 73.3 eggs per bird. During the months of December and January the Leghorn Pullets slightly exceeded the standard. They outlaid the average production during four months of the period and tied them the other two.

TABLE NO. 7.
S. C. W. Leghorns—125 Flocks.

Month	No. Pullets	No. Eggs	Eggs per Pullet
November	42,021	304,699	7.2
December	41,622	425,943	10.2
January	40,869	469,498	11.4
February	39,892	456,461	11.4
March	38,632	641,814	16.6
April	37,420	620,254	16.5
Total	40,076	2,918,669	73.3

TIME OF HATCHING.

Information upon the time the pullets were hatched was had from 149 different farms. 131 stated that their flocks were hatched before May 15, and 18 that their flocks were hatched after May 15. The flocks hatched before this date averaged to lay 73.2 eggs against 66.4 eggs for those that were later hatched, a difference of 6.8 eggs per bird for the period. The early hatched flocks laid 7.5 eggs per bird for November, 10.3 eggs for December, 11.3 eggs for January, 11.4 eggs for February, 16.5 eggs for March, 16.2 eggs for April, while the later hatched flocks averaged to lay 3.1 eggs for November, 8.5 eggs for December, 10.0 eggs for January, 10 eggs for February, 16.5 eggs for March and 18 eggs for April.

For the four winter months, November, December, January and February, the flocks hatched before May 15 outlaid the later hatched by 8.6 eggs, while the reverse was true for the months of March and April when the flocks hatched after May 15 outlaid the early hatched by 1.8 eggs per bird.

TABLE NO. 8.
Hatched Before May 15—131 Flocks.

Month	No. Pullets	No. Eggs	Eggs per Pullet
November	41,080	311,867	7.5
December	40,732	423,250	10.3
January	39,912	454,789	11.3
February	39,034	448,272	11.4
March	37,877	625,636	16.5
April	36,779	599,061	16.2
Total	39,235	2,862,875	73.2

TABLE NO. 9.
Hatched After May 15—18 Flocks.

Month	No. Pullets	No. Eggs	Eggs per Pullet
November	3,462	10,910	3.1
December	3,391	29,047	8.5
January	3,376	34,005	10.0
February	3,335	33,630	10.0
March	3,274	54,211	16.5
April	3,160	57,085	18.0
Total	3,333	218,888	66.1

ARTIFICIAL LIGHTS AND NO LIGHTS.

133 flock records made up the records for the study under this title. 77 records including 17,346 pullets started the period and ended it without lights, while 56 flocks including 23,052 birds started the year with some form of artificial lighting used. The flocks not under lights averaged to lay 67.6 eggs per bird,—5.6 eggs for November, 7.8

eggs for December, 8.8 for January, 9.9 eggs for February, 17.4 for March and 18.1 for April. The flocks that were artificially lighted laid 77.2 eggs or nearly 10 eggs per bird more during the six months than did the non-lighted flocks. They laid 8.7 eggs per bird during November, 11.3 eggs during December, 12.9 eggs for January, 12.5 eggs for February, 16.3 eggs for March and 15.5 for April. These ten eggs were made when the selling price of eggs was the highest for the year. It is interesting to note, however, that during the last two months of the period, March and April, the flocks that received no lights outlaid the lighted flocks by 3.7 eggs per bird. The reason for this no doubt is the fact that many of the flocks that were under lights went into a moult during the last two months while other flocks showed a thin condition.

TABLE NO. 10.
No Lights—77 Flocks.

Month	No. Pullets	No. Eggs	Eggs per Pullet
November	17,346	98,831	5.6
December	17,119	134,296	7.8
January	16,803	148,624	8.8
February	16,442	163,086	9.9
March	15,785	275,825	17.4
April	15,268	277,373	18.1
Total	16,460	1,098,035	67.6

TABLE NO. 11.
Lights—56 Flocks.

Month	No. Birds	No. Eggs	Eggs per Bird
November	23,052	186,192	8.7
December	22,736	257,736	11.3
January	22,311	289,002	12.9
February	21,807	274,002	12.5
March	21,345	348,977	16.3
April	20,601	320,736	15.5
Total	21,975	1,676,645	77.2

TIME OF LIGHTING.

Methods of lighting which are used a great deal in New Jersey are two. The first is the Evening Lunch plan, where the houses are lighted for an hour, from 8 to 9 or 9 to 10 at night. The other plan which is also in common use is morning lighting, where day and night are made of equal length by lighting the houses before daybreak.

33 flocks including 11,871 birds reported using the evening lunch plan. An average of 74 eggs were made under this method, which is approximately 7 eggs more than flocks made that did not have some form of lights during the six winter months. They average to lay 8.8 eggs during November, 11.9 eggs during December, 12.6 for January, 11.4 for February, 14.7 for March and 14.5 for April.

23 flocks including 11,181 birds reported using the morning system of lighting. An average production of 79.1 eggs, or a little over 12 eggs more than the flock using no lights, was averaged. This is also an average of 5 eggs more per bird than was produced under the evening lunch plan of lighting. Both systems of lighting gave equally good results during the first four months but the flocks that were managed under the morning method seem to have stood the four months' production better than the others, and as a result laid 5 eggs more per bird during the last two months of laying.

The pullets under the morning system of lighting averaged to lay 7.2 eggs per bird during November, 10.6 eggs during December, 13.2 eggs during January, 13.7 eggs during February, 17.9 eggs during March and 16.5 eggs during April.

TABLE NO. 12.
Evening Lunch—33 Flocks.

Month	No. Pullets	No. Eggs	Eggs per Pullet
November	11,871	105,240	8.8
December	11,706	140,369	11.9
January	11,435	144,543	12.6
February	11,131	127,127	11.4
March	10,832	159,969	14.7
April	10,459	153,209	14.6
Total	11,239	830,457	74.0

TABLE NO. 13.
Morning Lights—23 Flocks.

Month	No. Pullets	No. Eggs	Eggs per Pullet
November	11,181	80,952	7.2
December	11,030	117,367	10.6
January	10,876	144,459	13.2
February	10,676	146,875	13.7
March	10,513	189,008	17.9
April	10,142	167,527	16.5
Total	10,736	846,188	79.1

DECREASE IN NUMBER OF BIRDS.

Each month showed a slight decrease in the number of birds reported, both among the pullet and hen flocks. The average decrease in the farm flock each month was slightly less than 2%. For the six months it was 11.4%. The monthly decrease was 1.6% for December, 1.6% for January, 1.9% for February, 2.7% for March and 3.6% for April. The pullet flocks showed a smaller decrease than the average flock, the total decrease for the period being 10.7%. April saw the heaviest decrease which was 3.6%. The monthly decrease was as follows: December 1.3%, January 2.0%, February 2.0%, March 1.8%, and April 3.6%. It can safely be said that this decrease in the pullet flocks from month to month is due to mortality, the deaths during the first four months being caused from colds, roup and chicken pox while the mortality of the last two months can be contributed largely to ovarian troubles.

The average decrease for the 6 months in the hen flocks was 13.1% or slightly more than 2% a month. The monthly percentage of decrease was, December 2.4%, January .6%, February 1.6%, March 4.7% and April 3.8%. It is to be expected that December would show greater decrease than most months. This is no doubt caused from the constant removal of birds which do not appear quite good enough for the breeding pen. It is hard to state just why there should be such a high decrease for March and April. Ovarian troubles no doubt play a part, and culling another, but neither of these should account for the high percentage of 4.7% and 3.8% respectively.

TABLE NO. 14.

Decrease in No. of Birds—244 Flocks.

Month	Total No. of Birds	No. Pullets	No. Hens
November	0	0	0
December	1,850	1,072	778
January	1,822	1,586	236
February	2,035	1,523	512
March	2,838	1,377	1,461
April	3,744	2,621	1,123
Total	12,289	8,179	4,110

TABLE NO. 15

Per cent. Decrease in No. of Birds—244 Flocks

Month	All Birds	No Pullets	Hens
November	0%	0%	0%
December	1.6	1.3	2.4
January	1.6	2.0	.6
February	1.9	2.0	1.6
March	2.7	1.8	4.7
April	3.6	3.6	3.8
Total	11.4	10.7	13.1

DECREASE IN S. C. WHITE LEGHORN PULLETS.

The decrease among this variety of pullets was slightly above that of the average flocks. The decrease was 11.5% against 10.7%. The monthly decrease was .9% for December, 1.8% for January, 2.4% for February, 3.2% for March and 3.2% for April.

TIME OF HATCHING.

The comparison of the decrease in pullet flocks is rather interesting. The birds hatched before May 15 showed a decrease of 13.5% against 9.0% for the flocks hatched after May 15. The higher decrease in the flocks hatched before May 15 was no doubt due to deaths and these were caused from the heavy laying.

LIGHTING COMPARISONS.

The flocks that were managed without lights averaged 12.6% against 11.2% for those that were lighted. This seems to indicate under average conditions that lights have a beneficial effect on the health of the flocks. The flocks that were lighted under the evening lunch plan averaged 12.6% decrease against 9.6% for the morning plan of lighting.

TABLE NO. 16.

S. C. White Leghorn Pullets—125 Flocks.

Month	No. Birds	Decrease	Per cent. Decrease
November	42,021	0	0%
December	41,622	399	.9
January	40,869	753	1.8
February	39,892	977	2.4
March	38,632	1260	3.2
April	37,420	1212	3.2
Total	40,076	4601	11.5

TABLE NO. 17.

Time of Hatch Comparison.

Month	Per cent. decrease in flocks hatched before May 15.	Per cent. decrease in flocks hatched after May 15.
November	0%	0%
December	.8	2.0
January	2.0	.4
February	2.2	1.2
March	5.6	1.8
April	2.9	3.6
Total	13.5	9.0

TABLE NO. 18.

No Light and Lighting Comparison.

Month	Per cent. decrease No Lights.	Per cent. decrease Lights	Per cent. decrease Evening Lunch	Per cent. decrease Morning Lights
November	0%	0%	0%	0%
December	1.3	1.3	1.4	1.3
January	1.8	1.9	2.3	1.4
February	2.1	2.3	2.7	1.8
March	4.1	2.1	2.7	1.5
April	3.3	3.6	3.5	3.6
Total	12.6	11.2	12.6	9.6

TABLE NO. 19.

Summary Table Showing per cent. Decrease.

	All Birds	Hens	Pullets	S. C. W. Leghorns	Hatched before May 15	Hatched after May 15	No Lights	Lights	Evening Lunch	Morning Lights
Nov.	0	0	0	0	0	0	0	0	0	0
Dec.	1.6	2.4	1.3	.9	.8	2.0	1.3	1.3	1.4	1.3
Jan.	1.6	.6	2.0	1.8	2.0	.4	1.8	1.9	2.3	1.4
Feb.	1.9	1.6	2.0	2.4	2.2	1.2	2.1	2.3	2.7	1.8
Mar.	2.7	4.7	1.8	3.2	5.6	1.8	4.1	2.1	2.7	1.5
Apr.	3.6	3.8	3.6	3.2	2.9	3.6	3.3	3.6	3.5	3.6
To'l	11.4	13.1	10.7	11.5	13.5	9.0	12.6	11.2	12.6	9.6

Membership in A.A.I.P.H.

Canadian workers in poultry husbandry who wish to obtain information regarding the American Association of Instructors and Investigators in Poultry Husbandry, should communicate with the Secretary, Mr. L. F. Payne, Agricultural College, Manhattan, Kansas. The Association now has a membership list of approximately four hundred. The membership fee is $3.00 per year, which includes subscription to *Poultry Science*, the official organ of the Association. The Editor of *Poultry Science* is Mr. L. E. Card, Agricultural College, Amherst, Mass.

The Instructor's Job.

J. C. GRAHAM

Head of Poultry Department, Amherst, Mass.

In the following discussion the term "instructor" is used in the broad sense, embracing everyone on the payroll doing instructional and investigational work. However, as most colleges are on a deparment basis and the sum total of all the department staffs includes practically all the instructors and investigators, we may merely for convenience and clearness apply what we have to say to the department organization. According to my interpretation, an agricultural instructor in agricultural colleges is, or should be, more than an ordinary teacher. He is selected for the position because of his general aptitude for the work and also because of his special training. He is more than a mere wireless broadcaster. He is a specialist, an authority, a writer.

Now what is the instructor's job? What does it include?

So far as I know no one has ever made an analysis of the instructor's job. The nearest approach to it is found in correspondence between department heads and candidates for positions or between employment agencies and employers. Usually in this correspondence the duties or requirements are covered in very general terms in one or two sentences. Again on the arrival of the new instructor, he does not receive a contract (printed or typewritten circular) covering the subject of duties, except in regard to grades and reports sent to the Dean and Registrar. Instead he has a talk with the department head covering in a general way the courses and classes assigned him, so he does not realize the many and varied opportunities he has for work, but drops into a general routine of merely handling his regularly assigned classes, and may feel it an imposition if asked to perform other necessary departmental work. As a matter of fact I believe we have been taking too much for granted in throwing instructors almost wholly upon their initiative. In all fairness, should not candidates for positions be given a clear, full and concise statement covering the responsibilities of the position? Let us suppose that instead of writing the characteristic letter generally sent to candidates stating that they are expected to teach certain courses on such and such subjects, they are sent a letter somewhat as follows:

My dear Mr. Jones:

In response to your inquiry in regard to the duties involved in the position in which you are interested, allow me to say that you will be expected to teach the subjects of judging and culling, outlines of which will be found on page 36 of the catalog sent you at the time of my previous letter. In addition to the above, you will be assigned laboratory sections in course S-2 and possibly S-4, found in the two-year catalog sent under separate cover.

The maximum and minimum credit hour assignments per instructor are 20 and 12 respectively but these are not to be considered as definitely fixed. Our regular working day is from eight to five with an hour for lunch. However, there is no rule prohibiting prolonging the day if the instructor so desires or if it becomes necessary. College is closed usually Saturday afternoons and holidays. It must be understood, however, that unscheduled laboratory work like incubation, brooding, fattening, pen management, and plant management is performed as early as 6.30 in the morning and as late as 9 p.m., and that said exercises are held seven days per week. The inter-term vacations are for students and not instructors, unless the instructor wishes to consider them as a part of the one month's vacation mentioned in the terms of employment.

An instructor's responsibility does not end with the execution of his class room work. For his own sake, as well as that of the department, he is expected to keep in touch with current developments along his particular line; make a collection, properly catalogued and filed, of bulletins, circulars, and magazine articles; keep a scrapbook of pertinent photos, cuts, and clippings; make charts and photographs, and see that his

equipment, including lantern slides and mounted specimens, is kept adequate and up-to-date. The other members of the department staff may at times require his assistance with similar work. He is expected to answer letters referred to him, to prepare matter for publication dealing with his specialty, to review current technical literature for presentation to the staff, and upon occasion do some extension work, such as lecturing, judging or culling. He should be ready and willing to assume certain responsibilities at the poultry plant, either under the general supervision of the department head, or in his absence.

In short an instructor should give his whole-hearted loyalty and energy to the department and the institution, in return for which he is offered every opportunity possible for growth and self-improvement. When possible, provisions will be made for instructors to parallel their instruction work with investigations, where interest warrants, and time permits. An ideal instructor usually finds plenty to do, and needs no urging to greater efforts.

Hoping your questions have been answered to your satisfaction and assuring you that additional information will be sent upon request, I am

Sincerely yours,

Something like the above will leave the candidate in no doubt as to the range of his duties, and ways in which he can make himself helpful to the department. I am afraid too many instructors take a selfish view and feel themselves entirely separate from the machine rather than an integral part of it, or one of the main cogs of the drive-wheel. Are they always to blame for taking this view? I might say paranthetically that I believe our staff meeting has done more to consolidate interest, make each man feel his importance, keep the members up-to-date and secure harmony than almost any practice we have adopted.

It is not our purpose to differentiate to any great extent between Department Head and other members of the staff. The Department Head is responsible to the President and Trustees, not only for the administration of his department financially and otherwise, but to a great extent for the actions, quality and amount of work done by his assistants. In addition to his administrative duties, some of which it is hoped he can delegate from time to time to his trusted lieutenants, he will perform such others as in his judgment are deemed best for the department. These may be divided more or less equally among the three lines of work mentioned above or confined almost wholly to one. Naturally he will want a close contact with the public as well as the student body; the preparation of manuscripts for circulars, bulletins, the public press, or even books, will surely require a portion of his time. He should surely see that his assistants are thoroughly cognizant of their duties.

Applying the Measure Stick.

In the first place, the nature of subject matter taught should not be overlooked. The humanities, and to a certain degree the sciences, vary little from decade to decade, and are fairly well organized groups. Furthermore, these have been in school and college curricula for centuries and methods of presentation have been developed and fairly well standardized. On the other hand from the standpoint of instruction, agriculture is a new subject, with subject matter somewhat disorganized and constantly changing year by year. Therefore, the agricultural instructor to be successful must be much more resourceful and better trained than those teaching the other groups. In addition to the ordinary qualifications demanded of instructors, he must be a good mixer and able to make contact and establish confidence with farmers.

In the second place, in the sciences, humanities, economics, etc. an instructor's job can be measured fairly accurately by the number of credit hours taught correlated with the number of students. The usual time required for preparation of lectures or lessons, hearing recitations, grading papers and recording standings varies somewhat with the subject and the instructor, but on the whole it is fairly uniform. Furthermore, with the exception of the sciences there is no expensive or complicated apparatus to use and care for. By way of illustration let us say an instruc-

tor carrying 15 credit hours requires an additional 15 hours per week for preparation, marking and grading papers which gives him a 30-hour week.

Turning our attention to the agricultural instructor, we find that in carrying 15 credit hours, he too requires 15 additional hours for preparation, marking, and grading, when only ordinary laboratory materials are considered. Therefore it would appear that both are on a par, but when the nature of the laboratory work is considered there is no comparison. In addition to the 30 hours already mentioned the agricultural instructor is obliged to add approximately another 15 hours for the preparation of live laboratory specimens. In such laboratory work as pedigreeing, mating, breeding, incubation, brooding, growing, fattening, pen management, plant management, culling and judging, market eggs and poultry, we deal with an extremely large number of specimens, some of which are to be classified and others used for comparison. In either case the instructor must go over each specimen before it is taken to the laboratory. In order to add concreteness to the idea, let us use incubation as an illustration. Before the incubator is turned over to the student all parts must be examined carefully; the lamp, always a source of danger, is given extremely close scrutiny. The student then prepares the incubator for the reception of eggs by cleaning, levelling, heating and regulating which requires 3 to 4 days. All this is done under the watchful eye of the instructor. The eggs are then graded and selected. As a rule, it is impossible to prepare the incubator or select the eggs at regular laboratory periods, so the work is done at unscheduled hours. The eggs are then put in the incubator and for the next three weeks the instructor meets his class at 7.15 to 8.00 a.m., 12.30 to 1.00 M. and 4.30 to 5.30 p.m. and visits the incubator cellar at from 9.00 to 11.00 p.m., but at times this last task may be delegated. The incubator must be examined both before and after the student has performed his task. On the 7th and 14th days the eggs are candled by the student and in order to teach effectively the instructor candles the eggs first, placing private marks on outstanding types of unusual specimens. However, if the class is small and he can be with each student during the entire process, previous candling is unnecessary, but this rarely happens. On the morning of the 20th day the eggs begin to pip and the next 36 hours constitute a very critical period requiring much attention. When the hatch is over and the chicks removed, the instructor sees that the machines are properly cleaned and disinfected. Then follows several hours checking the students' records and data.

Let us now see what this means to the instructor in the way of credit hours. We found that in most subjects taught outside the agricultural group, the instructor devotes 30 hours per week to 15 credit, which is equivalent to 25 hours per credit for a 12 week term. We find that the incubator instructor puts in at least 4 hours per day for about 28 days, seven days a week and practically all of them may be termed "overtime", a total of 112 hours for one credit. I wish also to call attention to details. Incubators are individual machines that cannot be handled in groups: no two eggs are alike at the beginning nor at any time during the incubation period. It must be understood that the men do not get training enough to become expert or able to work along with any degree of accuracy, so individual attention is necessary throughout the course.

The agricultural instructor is responsible in part for the management of the plant and, as we are constantly being urged to make our laboratories as profitable as possible, this is no small responsibility.

When added to the above, the making of charts, securing photos, slides and other teaching equipment, cataloguing and filing bulletins, magazines and other press articles, keeping the rest of the staff posted on matters pertaining to his specialties, writing correspondence lessons, circulars, bulletins, articles for the press, handling a portion of the correspondence and doing some extension work, it must be admitted that the agricultural instructor has a fairly full program.

But what of it? Why this discussion? Just three questions: 1. Is the agricultural instructor getting a salary proportionate to the service rendered? 2. Regardless of salary, is he fitting himself for greater and better service, rendering himself indispensable to the department? 3. Is he drifting?

AMERICAN ASSOCIATION OF INSTRUCTORS

FIFTEENTH ANNUAL CONVENT

AUGU

P. A. FRANCIS

For the benefit of readers of *Scientific Agriculture,* we have featured, in this issue, some of the papers given at the above Convention. For this privilege we are indebted to the officers of the Association and to the Editor of *Poultry Science,* its official organ. Lack of space has prevented us from publishing more material, but we believe the papers appearing in this issue will be considered both interesting and instructive, and will convey some idea as to the important developments now taking place in the poultry industry.

Approximately one hundred and fifty members of the Association attended the meetings, which were held at the Central Experimental Farm, Ottawa. Banquets were tendered by the Dominion Department of Agriculture, the Ontario Department of Agriculture and the Ottawa Poultry Association. These, as well as other informal meetings, were held at the Chateau Laurier. Luncheon was provided each day by the Central Experimental Farm.

The attendance at the Convention, of Mr. Edward Brown of London, England, President of the International Association of Instructors and Investigators in Poultry Husbandry, and of Mr. P. A. Francis, Poultry Commissioner in the British Ministry of Agriculture, was highly appreciated.

) INVESTIGATORS IN POULTRY HUSBANDRY
XPERIMENTAL FARM, OTTAWA
24, 1923

Mr. Brown made a strong plea on behalf of the World's Poultry Congress, to be held at Barcelona, Spain, in May, 1924, and urged that both Canada and the United States should be well represented at that Congress. As a result of his appeal, a resolution was passed, naming ten delegates from the United States and five from Canada. Efforts will be made to ensure an even larger representation. At another meeting, Mr. Brown outlined the world-wide development of the poultry industry, based upon his personal contact with it during the past fifty years.

Mr. Francis has been travelling through the United States and Canada during the past four months, making an investigation of the poultry industry in those two countries, especially in regard to organization, extension and experimentation. He gave a very complete outline of the present poultry situation in Great Britain, and made a number of other contributions to the programme. He sailed from Quebec to England on August 25th.

It is of special interest to Canadian readers to know that Mr. F. C. Elford, Dominion Poultry Husbandman, was elected as President of the Association for the coming year. The 1924 Convention will be held in Carolina.

EDWARD BROWN

Federal Work in Poultry in the United States.

M. A. JULL

Chief of Poultry Division, Department of Agriculture, Washington, D.C.

The development of the poultry industry of the United States into an enterprise having an annual valuation of well over one billion dollars is no mean achievement. Particularly is this achievement the more remarkable in that the rate of increase from year to year in the quantity of eggs produced has been exceeded by few other agricultural commodities. The magnitude of an industry must be judged from the two standpoints of production and consumption. In respect to poultry production the claim may be made that more individuals are directly interested in keeping and breeding fowls than can be said of any other class of live stock and any class of plants. The number of persons directly interested in an industry is of primary importance in determining the amount of public funds made available for the development of one industry in relation to others. In respect to consumption, there are few other commodities so widely used as poultry meat and eggs. Taking the dietary and general requirements of life of the consuming classes as they exist today there is full justification for treating the money value output of poultry production in the United States as a measure of the stability and success of the poultry industry. The future of an industry of such nation-wide importance seems assured.

The resulting significance is that poultry husbandry must be made increasingly intelligent. The development of poultry science is imperative in order to meet the increased demand for more poultry products as well as for better poultry products. The investigation of poultry problems involves the development of knowledge of the production, distribution and consumption of poultry products and of the raw materials out of which they are made. What is needed is a clear conception of the nature of the problems and means for deriving the needed data for their solution.

We have a vague idea of the nature of some of the problems at least, and there are many means already available for deriving the needed data for their solution. Concerning the means available, I shall enumerate and briefly discuss their functions, as I see them. My purpose in enumerating the organizations and institutions serving the development of the poultry industry in its entirety is in order that we get a proper perspective of the needs of the industry as a whole and in order that we may better appreciate the service of the Federal Department of Agriculture in relation to the service of all other agencies. By viewing the whole, one gets a better idea of the relation of the part to the whole.

The major agencies which have served in the development of the Poultry industry include: The American Poultry Association, the International Baby Chick Association, the American Association of Instructors and Investigators in Poultry Husbandry, the Agricultural Colleges, The State Experiment Stations, The State Departments of Agriculture, and the Federal Department of Agriculture.

One of the chief functions of the American Poultry Association has been the adoption and continued improvement of standards for the various breeds and varieties of poultry. In a large measure, therefore, the foundation of the poultry breeding industry rests upon the standardization of the breeding work. The development of new breeds has served as a stimulus in arousing interest in the art of breeding, whether it be for perfection in form or perfection in feather. Even the breeding of bantams has served a very useful purpose in enlisting the interest of many, who otherwise might never have become concerned with any phase of the poultry industry. The breeding of Games, whether for the cock-pit or the exhibition has served to develop the resources of many in the art of breeding for its own sake, and I am inclined to believe that utility breeders have something to learn from the breeders of Games in respect to the maintenance of constitutional vigor in the breeding stock. There are some who think that standard and utility

qualities are things apart and have conflicting interests; but surely in the best interests of the American poultry industry, standard and utility qualities should be combined. The danger is that we are so inclined to go to extremes, and while there has been a tendency to over-emphasize non-utilitarian points so there is more recently a tendency to disregard standard points of type and other characteristics and to belittle the intrinsic value of the beautiful. Would it not be a wise procedure to retain the beautiful while developing the useful? At any rate, it is felt that the American Poultry Association by maintaining high standards has done much for the art of breeding.

The International Baby Chick Association has been absorbed with numerous problems pertaining strictly to the baby chick industry, and the organization has been instrumental to a high degree in improving conditions.

In another way the American Association of Instructors and Investigators has rendered valuable service in raising the standards of teaching, in improving methods of conducting extension work and in developing materially the fields of experimentation and investigation.

It is probable that the Poultry Departments of the State Agricultural Colleges have been a more potent factor than anything else in the development of the poultry industry. Qualified instructors and investigators have been turned out in considerable numbers in order to meet the demand for their services. A vast number of men and women have received instruction in various ways, enabling them to make the production of poultry products more highly remunerative. Extension services have been greatly extended and are now reaching the more remote sections of the country. Experimental and investigational work has been developed materially in order to meet the need for newer knowledge. In brief, poultry husbandry has been made increasingly intelligent and the Agricultural colleges can take considerable satisfaction in the present status of the industry.

The State Experiment Stations through the experiments conducted have contributed materially to our knowledge of specific and general problems. A few of the Stations have been outstanding in respect to the nature of the problems studied and the quality of the work performed.

The services rendered by the different agencies enumerated up to the present might perhaps convey the impression that the field is thoroughly covered, but there is still a larger field and a larger service, a service designed to unify the efforts of all the agencies, to whatever extent is possible. The larger service is also designed to serve the best interests of the poultry industry from the national standpoint. In this connection there are problems of very great importance, but which can not be undertaken by any other agency.

The services of the Federal Department of Agriculture embrace matters of an administrative, legislative and investigational character. It would be highly desirable to treat of the services of the Federal Department under these three headings, but this is manifestly impossible owing to the nature of the organization of the various agencies within the Department. On the other hand, a discussion of the services rendered by the Federal Department will be made much more comprehensive if treated from the standpoint of the organization of the work.

To give you some idea, first, of the character of the services rendered the poultry industry in one way or another, the different organizations within the Department of Agriculture are briefly enumerated here, and include the Bureau of Agricultural Economics, the Bureau of Entomology, the Pathological Division, Biochemic Division, Office of Exhibits, Office of Motion Pictures, States' Relation Service, Office of Editorial and Distribution Work, and the Division of Animal Husbandry. The different aspects of the activities of the organizations of the Department will be dealt with very briefly indeed.

Concerning the phases of the poultry and egg industry covered by lines of work of the Division of Dairy and Poultry Products of the Bureau of Agricultural Economics, the following is submitted by the Bureau:—

"The work of the Bureau of Agricultural Economics relating to the Poultry and Egg Industry may be considered from the standpoint of (1) research and investigational; (2) service; and (3) extension and survey.

Under the heading of Research and Investigational work the Division is now conducting a study of the standardization of eggs with the view to adopting classes, standards and grades of eggs for use in connection with an egg inspection service which it will establish at an early date in the two important distributing markets of Chicago and New York and later will exend this service to other markets including Boston, Philadelphia and San Francisco. Investigations of a similar character are contemplated with respect to poultry with a view to establishing a similar inspection service on both live and dressed poultry.

"During the past year, two manuscripts have been prepared for publication, one entitled "Marketing Eggs" and the other entitled "Marketing Poultry". A third manuscript will be prepared at an early date covering the equipping and operating of poultry and egg packing plants and a fourth publication on co-operative poultry and egg markets.

"The Division during the present year has conducted a preliminary study of the processing of eggs by the guaranizing method.

"The Service activities of the Division include at present a Market News Service on poultry and eggs but as stated above, it is planned to inaugurate also an inspection service on eggs at an early date. The news service on poultry and eggs includes statistical information on the receipts of eggs in the five important markets where branch offices have been established, i.e., Boston, New York, Philadelphia, Chicago, and San Francisco; also cold storage movement. Monthly reports are issued of stocks of eggs and poultry in cold storage as well as imports and exports. Although this service has been developed to include price reports to a limited extent, it is planned to enlarge this feature of the service during the present fiscal year to include prices of eggs and possibly dressed poultry on the five markets named.

"The extension and survey work of the Division relating to eggs and poultry, have consisted principally of personal assistance given State Colleges of Agriculture and State Departments of Agriculture in studying marketing methods and conditions at primary markets, particularly from the standpoint of the need or desirability of producers organizing for co-operative marketing purposes. At present there is a great demand for this work and the services of one representative in the field are continually employed in making surveys of poultry and egg marketing conditions."

The Pathological Division and the Bureau of Entomology have under their consideration measures of disease and parasite control.

The Biochemic Division is primarily interested in nutrition problems and, at the present time, is co-operating with the Division of Animal Husbandry in fundamental lines of investigational work, dealing particularly with vitamine studies.

The States' Relations Service is primarily interested in supervising the distribution of Smith-Lever funds. Projects are developed by different State organizations and before Smith-Lever funds are made available these projects must be approved by the States' Relations Service.

The Office of Exhibits prepares and distributes exhibits of various kinds covering different phases of the poultry industry. Subject matter is provided by different organizations acting in co-operation, and the Office of Exhibits visualizes the subject matter in the form of display. When these exhibits are prepared they are sent around on fall fair circuits or are distributed among the leading poultry shows of the country.

The Office of Motion Pictures has made available for distribution eight films on poultry subjects. These films are available for purchase at the cost of about 4c per foot, and can be obtained by state colleges, county agents, and others interested in poultry work. The only expense involved in the use of these films is the shipping charges from Washington and return.

The Office of Editorial and Distribution Work is responsible for the publication of news pertaining to development work in behalf of the poultry industry, the publication of circulars and bulletins and their distribution.

The Division of Animal Husbandry, as far as its poultry interests are concerned, is primarily interested in investigational work. The major lines of investigational work will

embrace the subjects of genetics and nutrition or breeding and feeding. The principle has already been laid down of proceeding from the problem standpoint. The procedure involves the analysis of methods to get at their real nature and content and the resolution of complex questions into parts which are sufficiently simple and self-contained to be capable of study. From the standpoint of successful prosecution of research an open and unbiased mind and the ability to use skillfully all the working tools which are afforded by a proper knowledge of the fundamental sciences are necessary qualifications. To this end the Division of Animal Husbandry has on its staff a Geneticist and is about to appoint a Biochemist. Such a situation should enable the Division to grapple with the great difficulty in poultry investigation, which is the large number of factors frequently involved in any particular problem. The problem may engage a wide range of phenomena, and simplification and definiteness of purpose give direction to the making of records and the gathering of data.

It is felt that success in our investigational work will be largely a matter of methods. Referring particularly to our investigational work we shall avoid being so rash as to promise the performance of plans, for long in advance.

The poultry plant is located at Beltsville, Maryland, some fifteen miles from Washington. It comprises some sixty acres of land and the plant as developed up to the present has been hewn out of the forests. There is a large number of buildings, including an incubation and nutritional laboratory, an experimental brooding and fattening house, three long laying houses and a large number of colony houses. With a little rearrangement and with more clearing the plant will be in excellent shape for carrying on investigational work.

As far as concerns the policy of the Division of Animal Husbandry, in its relation with other agencies in the country, it is expected that such organizations as the American Poultry Association, the International Baby Chick Association and the American Association of Instructors and Investigators in Poultry Husbandry will be supported to whatever extent is possible. The Division will also strive to keep in the closest possible touch with the work of the State Colleges of Agriculture and the State Experiment Stations. The Washington Office must keep itself well informed concerning prevailing conditions throughout the country and just as, in some matters, co-operation among the States is necessary, so co-operation between each state and the Federal Office is highly desirable. It is hoped in turn that the Federal Office may be of the greatest possible assistance to the work being carried on at the various State institutions. In one sense at least, the Federal Office should be regarded in the light of a national clearing house for information and data of interest to the poultry industry in all parts of the country. Then again, in order to be of the greatest possible service the Federal Office should keep in touch with the more fundamental lines of work, particularly investigational work, in foreign countries.

In laying plans for the future there must be vision and method and all possible knowledge must be made available and it must be organized. Accuracy of judgment will be conditioned largely by the state of organized knowledge and its intelligent combination to the end in view.

The Effect of Coccidiosis on Growing Stock.

J. W. FULLER

Ithaca, N.Y.

Intestinal Coccidiosis is the most destructive disease of young stock in New York State. It is caused by a protozoan parasite, eimeria avium (*Coccidium tenellum*).

Chicks from two to eight weeks of age, soon after they have been allowed to run out of doors, sustain the heaviest losses. However, chicks have been observed to die from the disease at five days of age. Old birds often carry and spread the parasite, but the mortality in the old birds is very low.

Strong, vigorous chicks are attacked as readily and with as dire results as weaker stock. Cool, damp seasons favor the development and spread of the disease.

Symptoms.

The affected chicks will eat only scantily, will have a dull appearance, stand in the corner with drooped wings or huddled near the stove.

There is usually a diarrhoea present; sometimes it is chalky white but more often it is bloody. The mortality is often as high as 90%.

Chicks show symptoms in from five to ten days after ingesting the sporulated oocyst. Chicks may die without showing any symptoms at all, but usually live for only several days, except those cases that become chronic.

The duodenum and ceca are the favorite seats of attack. The lesions in the duodenum of acute cases are usually a slight reddening showing on the outer and inner surfaces. Scrapings of the mucosa of the affected part, examined microscopically, reveal the parasite. In chronic cases the mucosa of the duodenum is thickened and has a thick yellowish exudate. The ceca may be filled with blood or may contain a white or reddish-white, caseous mass which when removed remains a cast of the organ.

Diagnosis is made by the lesions and finding the parasite microscopically.

Pullets which have passed through an attack, often come to laying age in an emaciated condition. This is most readily recognized by handling them. They are underweight and there is little or no flesh on the breast. Other birds may not be emaciated but will act as carriers.

The carriers are a source of danger in the breeding pen, whether they transmit the coccidia through the egg or not.

The writer has seen a severe infestation of coccidiosis in chicks that had never been allowed on the ground. They were hatched from a flock of hens which was heavily infested with coccidiosis, The hens and chicks were kept in the same building and cared for by the same attendant. The parasite was no doubt carried on the feet of the attendant or by rats.

Treatment.

The most satisfactory treatment consists of adding one teaspoonful of powdered crude catechu to each three gallons of their drink. Allow them this and no other drink for three days, then clear drink for one day, then repeat the medicated drink for three more days, etc. for a week after all birds recover. As catechu tends to constipate, their droppings should be watched and if they become hard, one-fourth pound of epsom salts should be given in the drinking water for one hundred chicks.

Conclusions.

1. Coccidiosis is a very serious and destructive disease in New York State.
2. Pullets that recover often reach maturity in an emaciated and unprofitable state.
3. Carriers may act as a means of infecting growing stock on the premises.
4. The best treatment to date is powdered crude catechu given at the rate of one teaspoonful in each three gallons of drink for three consecutive days, then clear drink for one day, then the medicated drink for three more days, etc.

Vaccination of Poultry and What it Has Proved.

By A. KELLAR GOODWIN

U. S. Veterans' Bureau, Vocational School, Chillicothe, Ohio.

"Vaccination is an outgrowth of man's effort to protect himself from pestilence by using nature's methods of defense," says Dr. G. W. McCoy, director of the Hygiene Laboratory of the U. S. Public Health Service. Primitive man noticed that recovery from a first attack by most diseases gave immunity against other attacks; and some 2000 years ago he began to vaccinate his fellows with smallpox when conditions seemed propitious, instead of waiting for nature to do it at some time when conditions might be very unpropitious. Vaccination against smallpox was made in India and China as early at 300 B.C. Later, when the disease reached Europe, vaccination went with it, and so it passed from nation to nation, being accepted by each generation who in turn made improvements and applied the same to other animal life than men, until to-day it is conceded to be the greatest weapon of defense with which to guard all animal life.

It is an interesting fact that the fundamental work of Pasteur upon protective vaccination in fowl cholera about 1880-82, was the first attempt to produce by use of artificial cultures immunity against a communicable disease, and was the basis for all later work in this field, the valuable results of which, at the present day, we see in the protective vaccination of so many diseases of animal life.

From time to time I have been questioned by poultry men from Ohio and Kentucky as to the advisability of the vaccination of poultry against roup, canker, sore-head, chicken-pox and fowl diptheria. I have noticed at different times advertisements appearing in the various trade publications making very broad assertions as to the advantages of vaccination. Not being in a position to make a positive statement regarding its prophylactic resistance, and the probable influence that it might have on future egg yield, the effect upon the fowls at the time of vaccination, and the number of deaths which might occur as a direct result from the administration of the bacterin, I decided to run a series of experiments to determine this for myself.

I used Avian Mixed Bacterin, which is prepared under U. S. Veterinary License and which is composed of several killed cultures of different diseases, suspended in a normal salt solution. It is administered subcutaneously at intervals of three days, using ½ c.c. or approximately 8 drops as a normal dose.

We used in this experiment, yearling Single Comb Brown Leghorns, Anconas, that were three years of age, and growing stock consisting of Jersey Black Giants hatched during the month of May, 1922. By the above selection it was possible to ascertain the effect on both light and heavy breeds at different ages.

The experiment started in November, 1922 and the single comb Brown Leghorns were divided into two groups, and selected at the time, using constitutional vigor as a guide. Particular pains were taken that each group was fairly divided from a laying standpoint. The two groups of Leghorns were placed in an Ohio type house 20x40 feet—the vaccinated group occupying one half of the house and the controls the other half, being separated by poultry netting. This placed them under like conditions. Each group was allowed the privilege of a runway 50 x 200 feet and was given just ordinary care. Their feed consisted of the regular Cornell ration. The Jersey Giants were treated likewise.

In the case of the Anconas, they were divided into two groups and no particular attention was paid to their selection. We vaccinated them just as they were removed from the catching coop. After vaccination, Mr. Norbert G. Ottke, Mr. George W. Johnson and myself compared the two groups and each of us agreed that the control birds had considerable advantage when judged by comparison without handling the birds, and especially was this true when we reviewed their past egg records.

The birds were all vaccinated by students of this school who had no previous experience in vaccination, 35 different students taking part in the work. To Mr. Norbert G. Ottke and Mr. George W. Johnson I wish to acknowledge my indebtedness for the following accurate records kept by them throughout the experiment.

NOVEMBER

ANCONAS

Controls	Cocks	7	No Sick birds.
	Hens	67	
Egg Production		16.6	
Vaccinated	Cocks	7	
	Hens	67	No Sick birds.
Egg Production		15.48	

BROWN LEGHORNS

Control	Cocks	6	Hen No. 282, Hospital 11/7, Obstruction in
	Hens	57	trachea.
Egg Production		18.54.	
Vaccinated	Cocks	6	No Sick birds.
	Hens	57	
Egg Production		20.14.	

JERSEY GIANTS

Controls	Cocks	2	
	Hens	42	No sick birds.
Vaccinated	Cocks	3	
	Hens	47	No sick birds.

DECEMBER

ANCONAS

Controls	Cocks	7	Hen No. 220 Hospital 12/7 Cold.
	Hens	67	
Egg Production		14.14	
Vaccinated	Cocks	7	No sick birds.
	Hens	67	
Egg Production		13.84	

BROWN LEGHORNS

Control	Cocks	6	Hen No. 90 died 12/24, Pneumonia.
	Hens	57	
Egg Production		15.46	
Vaccinated	Cocks	6	
	Hens	57	No sick birds.
Egg Production		16.02	

JERSEY GIANTS

Controls	Cocks	2	Hen No. 280, Hospital 12/14. Frosted feet.
	Hens	42	
Vaccinated	Cocks	3	No sick birds.
	Hens	47	

JANUARY

ANCONAS

Controls	Cocks 7 Hens 67		
Egg Production	14.94	Hen No. 203, Hospital 1/5.	Frosted.
		Hen No. 570, Hospital 1/7.	Cold.
Vaccinated	Cocks 7 Hens 67	No sick birds.	
Egg Production	13.02		

BROWN LEGHORNS

Control	Cocks 6 Hens 56	Hen No. 621, Hospital 1/7.	Frosted Comb.
Egg Production	22.11		
Vaccinated	Cocks 6 Hens 57	No sick birds.	
Egg Production	22.84		

JERSEY GIANTS

Controls	Cocks 2 Hens 42	Cock No. 278, Died 1/21.	Pneumonia.
Vaccinated	Cocks 3 Hens 47	No sick birds.	

FEBRUARY

ANCONAS

Controls	Cocks 7 Hens 67	Hen No. 231, Hospital 2/14.	Cold.
		Hen No. 214, Hospital 2/27.	Roup.
		Cock No. 264, Hospital 2/11.	Frosted Comb.
Egg Production	20.1		
Vaccinated	Cocks 7 Hens 67	No sick birds.	
Egg Production	18.84		

BROWN LEGHORNS

Control	Cocks 6 Hens 56	Hen No. 460, Hospital 2/23.	Cold.
Egg Production	35.56		
Vaccinated	Cocks 6 Hens 67	No sick birds.	
Egg Production	39.64		

JERSEY GIANTS

Controls	Cocks 1 Hens 42	Hen No. 274, Hospital 2/4.	Cold.
		Hen No. 269, Hospital 2/21.	Diarrhoea.
Vaccinated	Cocks 3 Hens 47	Hen No. 708, Hospital 2/20.	Cold.

MARCH

ANCONAS

Controls	Cocks 7 Hens 67	Cock No. 224, Hospital 3/1, Diarrhoea. Cock No. 224, died 3/12. Diarrhoea. Cock No. 234, Hospital 3/14, Roup.
Egg Production	22.46	Hen No. 201, Hospital 3/18, Cold.
Vaccinated	Cocks 7 Hens 67	Hen No. 693, Hospital 3/23, Cold.
Egg Production	21.64	

BROWN LEGHORNS

Control	Cocks 6 Hens 56	Hen No. 258, Hospital 3/25, Cold. Hen No. 298, Hospital 3/25, Cold. Hen. No. 86, Hospital, 3/25, Observation.
Egg Production	48.74	Hen No. 86, died 3/20. P. M. findings: Kidneys enlarged 2 in. length, normal in breadth and thickness. Intestines contained light yellow fluid, acid reaction.
Vaccinated	Cocks 6 Hens 57	No sick birds.

JERSEY GIANTS

Controls	Cocks 1 Hens 42	Cock No. 271, Hospital 3/12, Canker left jaw, deposit over ¾ surface mouth. Cock No. 271, died 3/16. Ditto. Hen No. 263, Hospital 3/18, Roup.
Vaccinated	Cocks 3 Hens 47	Hen No. 740, Died 3/28, Roup.

APRIL

ANCONAS

Control	Cocks 6 Hens 67	Hen No. 534, died 4/4. t.b. Hen No. 252, Hospital 4/11, Cold. Hen No. 204, Hospital 4/14, Cold.
Egg Production	25.4	Hen No. 227, Hospital 4/17, Cold.
Fertility	51.4	Cock No. 234, Died 4/21, Roup.
Hatched	21.78	Hen No. 211, Hospital 4/21, Cold. Hen No. 235, Hospital 4/28, Severe cold. Hen No. 223, Hospital 4/30, Cold.
Vaccinated	Cocks 7 Hens 67	Hen No. 756, Hospital 4/7, Cold.
Egg Production	22.79	
Fertility	53.	
Hatched	22.60	

(APRIL, *continued*)

BROWN LEGHORNS

Control	Cocks 6	Hen No. 267, Hospital 4/7, Cold.
	Hens 55	Hen No. 296, Hospital 4/11, Canker.
		Hen No. 296, Died 4/26, Canker.
Egg Production	50.82	Hen No. 96, Hospital 4/28, Roup.
Fertility	58.7	Hen No. 250, Hospital 4/ Cold. One eye
Hatched	24.31	slightly swollen.
Vaccinated	Cocks 6	Hen No. 236, Hospital 4/18, Cold.
	Hens 57	Hen No. 252, Hospital 4/25, Bumblefoot.
Egg Production	56.92	
Fertility	59.16	
Hatched	24.19	

JERSEY GIANTS

Controls	Cocks 0	Hen No. 277, Died 4/16, Pneumonia.
	Hens 42	Hen No. 705, Hospital 4/30, Roup.
		Hen No. 713, Hospital 4/30, Cold.
		Hen No. 722, Hospital 4/30, Cold.
Vaccinated	Cocks 3	Cock No. 721, Died 4/26, Pneumonia.
	Hens 46	

MAY

ANCONAS

Controls	Cocks 5	Hen No. 213, Hospital 5/9, Cold.
	Hens 66	Hen No. 247, Hospital 5/12, Cold.
		Hen No. 251, Hospital 5/17, Oviduct rup-
Egg Production	36.6	tured.
Fertility	63.74	Hen No. 787, Hospital 5/28, Roup.
Hatched	31.61	Hen No. 787, Died 5/30. Roup.
Vaccinated	Cocks 7	
	Hens 67	No sick birds.
Egg Production	34.81	
Fertility	63.89	
Hatched	30.97	

BROWN LEGHORNS

Controls	Cocks 6	Cock No. 284, Died 5/9, Ruptured blood-
	Hens 54	vessel.
		Hen No. 291, Hospital 5/11, Cold.
Egg Production	47.11	Hen No. 298, Died 5/17, Roup.
Fertility	68.71	
Hatched	32.1	
Vaccinated	Cocks 6	
	Hens 57	No sick birds.
Egg Production	48.7	
Fertility	68.89	
Hatched	32.84	

JERSEY GIANTS

Controls	Cocks 0	
	Hens 41	No sick birds.
Vaccinated	Cocks 2	
	Hens 46	No sick birds.

JUNE

Controls	Cocks 5	Hen No. 214, Hospital 6/11, Cold.
	Hens 65	Hen No. 245, Hospital 6/29, Cold.
		Hen No. 237, Hospital 6/29, Cold.
Egg Production	40.09	Hen No. 237, Died 6/29, Pneumonia.
Fertility	74.61	
Hatched	56.4	
Vaccinated	Cocks 7	Hen No. 693, Hospital 6/23, Cold.
	Hens 67	
Egg Production	39.91	
Fertility	73.85	
Hatched	56.97	

BROWN LEGHORNS

Controls	Cocks 5	No sick birds.
	Hens 53	
Egg Production	58.92	
Fertility	79.58	
Hatched	61.1	
Vaccinated	Cocks 6	No sick birds.
	Hens 57	
Egg Production	61.1	
Fertility	78.85	
Hatched	57.14	

JERSEY GIANTS

Controls	Cocks 0	No sick birds.
	Hens 41	
Vaccinated	Cocks 2	
	Hens 46	No sick birds.

JULY

ANCONAS

Controls	Cocks 5	Hen No. 223, Hospital 7/21, Eye watering.
	Hens 64	
Egg Production	33.46	
Fertility	81.01	
Hatched	68.37	
Vaccinated	Cocks 7	
	Hens 67	Hen No. 789, Died 7/19, Tumor.
Egg Production	32.97	
Fertility	80.97	
Hatched	68.91	

(JULY, *continued*)

BROWN LEGHORNS

Controls	Cocks	5	No sick birds.
	Hens	53	
Egg Production		49.18	
Fertility		85.19	
Hatched		69.37	
Vaccinated	Cocks	6	Hen No. 214, Hospital 7/18, Observation.
	Hens	57	Hen No. 214, Died 7/19, Intestinal worms.
Egg Production		42.57	
Fertility		90.12	
Hatched		68.49	

JERSEY GIANTS

Controls	Cocks	0	No sick birds.
	Hens	41	
Vaccinated	Cocks	2	No sick birds.
	Hens	46	

CONCLUSIONS

1. Avian Mixed Bacterin is non-poisonous.
2. No immediate deaths resulted from vaccination.
3. Vaccination does not affect egg yield.
4. Vaccination in no way in so far as we could ascertain, affected fertility.
5. It absolutely does not affect the table quality of the fowl.
6. It seems that the percentage of hatch was about evenly divided between the controls and the vaccinated birds.
7. I do not believe it possible to introduce diseases in the flock by its use.
8. I believe it advisable to guage the dose according to the weight of the fowl.
9. It will prevent the spread of colds among the flock, thereby warding off roup, diptheria, canker, etc., which are the after effect of colds.
10. I personally do not recommend the vaccination of poultry where conditions are known to be hopeless, and for which destruction is the only cure; fowl tuberculosis is one of these, that although preventable, is practically incurable. Tumors and abdominal dropsy are other diseases for which vaccination is not intended.
11. I highly recommend vaccination and am firmly convinced that thousands of fowls can be saved each year by resorting to its use.
12. It does not require a person skilled in this line of work to administer vaccine.

The underlying basis for further development in progressive methods of the treatment of diseased birds, depends upon accurate interpretation of scientific investigations, and I personally make a plea for more research work in Vaccine Therapy that we may see the advantages of same when applied to poultry.

La Raison d'Etre de la Société des Agronomes Canadiens.

*Discours du président Reynolds à la convention du mois de juin.**

Tous les groupements professionnels et techniques ont leurs organisations dont la raison d'être réside dans les services qu'elles rendent au public, à la profession et aux membres pris individuellement.

L'agriculture est le plus vieux des arts et la plus nouvelle des sciences; elle se range parmi les professions les plus récemment reconnues. L'importance de l'agriculture, comme science et comme profession, est proportionnée à son importance comme source de richesse nationale. Il semblerait donc raisonnable que toute action collective tendant à protéger l'agriculture professionnelle, à la relever dans l'estime et à augmenter son efficacité fût approuvée et appuyée par tous les membres éligibles de cette profession et par le public en général.

Les recherches et l'enseignement, de même que l'administration, pour être efficaces, doivent viser au maintien et à l'amélioration de l'agriculture et de la vie rurale. Tout ce que nous faisons pour atteindre cette fin constitue un service inappréciable à la nation. Ce service n'est pas uniquement matériel, mais il est encore humanitaire. La richesse nationale dépend en grande partie du succès de l'agriculture et notre stabilité politique et sociale dépendent du caractère de la population rurale.

Les colons canadiens sont sortis de toutes les classes parce que l'on trouve un certain esprit d'aventure chez les hommes et les femmes de toutes les classes. Un grand nombre, peut-être la majorité des pionniers ruraux, sont sortis des classes laborieuses, c'est-à-dire des rangs des ouvriers et des paysans des vieux pays.

En s'établissant au Canada, ces pionniers voulurent s'arracher des serres de la pauvreté et de la servitude qui étaient leur lot, chez-eux. Comme ils se rappelaient leur origine et pendant qu'ils s'appliquaient à la poursuite de leur but, eux et leurs descendants, jurèrent de ne jamais plus se laisser reduire à l'état de vassaux. Ils avaient formulé le project de s'asseoir à l'ombre de leurs propres vignes et figuiers, de cultiver leurs propres champs de blé et leurs vergers et de posséder en propre leurs bestiaux que personne n'oserait plus molester. Ils se déterminèrent à conquérir la liberté: liberté d'éduquer leurs enfants et d'adorer leur Dieu dans les écoles et dans les églises qu'ils construisirent de leurs mains; de choisir leur occupation et de maintenir ouverts pour eux et pour leurs enfants les sentiers du service et du succès, même en dehors de l'agriculture. Ils ont compris que l'unique moyen de prévenir leur propre rétrogression à l'état de simples paysans, même au Canada, était de maintenir ouverts les issues d'échappement, lorsque les conditions de la vie rurale deviendraient intolérables.

Les événements économiques sont inexorables. La déité qui préside à la civilisation moderne de plus en plus compliquée semble demander un sacrifice humain. Les villes sortent de la terre et deviennent des cités; elles engendrent des industries, le commerce et autres activités parfaitement organisés et monopolisés. L'agriculture demeure la seule industrie sans organisation et sans protection. Cette situation se produisit dans l'Ontario dans la première partie du dix-neuvième siècle et le cultivateur ontarien commença à chercher en dehors la liberté qui semblait lui échapper chez lui. Des milliers s'enfuirent dans le Dakota et dans l'Ouest canadien. L'Ouest canadien présentait des étendues apparemment illimitées de terre fertile qui sollicitaient le cultivateur de l'Est et lui offraient une occasion nouvelle de se faire une existence conforme à celle qu'il avait rêvée. Les chemins de fer pénétrèrent dans l'Ouest canadien et en rapportèrent des millions de minots de blé que le cultivateur offrit au marché de l'Est américain et de l'Europe. Les villes et les cités s'y développèrent et absorbèrent ses produits, emmagasinèrent et vendirent son grain, importèrent et distribuèrent ces milles et une choses nécessaires au foyer et à la ferme de l'Ouest.

* Traduit par M. J.-N. Ponton.

Assurément la liberté devait régner en souveraine absolue dans l'Ouest! Les cultivateurs s'y trouvèrent cependent bientôt en face de problèmes économiques eux aussi, et là encore surgît la lutte provenant de la compétition d'une classe de travailleurs non organisés contre les organisations qui ménaçaient de lui escamoter sa liberté économique. L'histoire de l'organisation des cultivateurs de l'Ouest contient le récit de cette lutte.

Une lueur de victoire avait commencé à poindre à l'horizon; les cultivateurs étaient même arrivés à une entente pratique avec ce qu'ils appelaient les "Gros Intérêts", lorsque le guerre, par son déclanchement et par sa fin, les laissa en présence d'une véritable révolution économique.

Le cultivateur canadian de l'Est comme celui de l'Ouest avait dirigé ses efforts vers l'obtention, pour son travail manuel et intellectuel et pour ses placements pécuniaires, d'une rémunération équitable et comparable au rendement du travail manuel et intellectuel et du capital des autres classes de la société. L'on en était même à établir une certaine règle à la mesure de laquelle les produits du cultivateur avaient acquis une valeur supposée acceptable dans l'échange avec les matériaux pour l'exploitation agricole et pour la vie du foyer. Le travail, l'intelligence et le capital qu'il consacrait à la production du blé, du foin, du lait, du boeuf ou du porc, avait acquis une certaine valeur d'échange à la faveur de laquelle un certain nombre de minots ou de tonnes ou de livres de ses produits pouvaient être échangés contre les produits du travail de l'industrie et du commerce urbain. Si nous admettons que la valeur de l'échange atteinte avant la guerre était acceptable, alors le présent taux est décidément au désavantage du cultivateur.

Voici la comparison des taux d'échange entre les produits de la ferme et la machinerie, en 1914 et en 1921 respectivement. Le cultivateur doit récolter du foin pour ses animaux de boucherie; il lui faut donc une faucheuse pour couper son foin. En 1914, le cultivateur pouvait obtenir une faucheuse en échange de 700 livres de boeuf. En 1921, le taux d'échange était de 1550 livres de boeuf pour une faucheuse. Si ce même cultivateur employait une chargeuse à foin, il pouvait l'échanger contre trois tonnes et sept dixième de foin, en 1914. En 1921, le manufacturier exiga huit tonnes de foin pour la même machine. Le cultivateur qui cultive du blé et de l'avoine a besoin d'un semoir à disques pour les semer et d'une lieuse pour les récolter. En 1914, il pouvait se procurer un semoir à disques pour le prix de 166 minots d'avoine et une lieuse pour le prix de 133 minots de blé. En 1921, le même semoir lui coûtait 416 minots d'avoine et la même lieuse 200 minots de blé. Une charrue polysocs en 1914 coûtait 744 livres de porc; en 1921, elle en coûtait 1200 livres. Pour la production des patates, il faut employer un cultivateur. En 1914, cette machine coûtait 39 sacs de patates et en 1921, 136 sacs. Pour produire du beurre, il faut des pâturages, du foin, du grain, des racines et de l'ensilage qui ne poussent qu'en terre grasse. En 1914, 430 livres de beurre achetaient un épandeur à engrais qui en 1921 en coûtait 840 livres.

Je ne voudrais pas poser devant vous en alarmiste ou en agitateur. La seule raison d'être de mes avancés, c'est qu'ils sont vrais d'abord; à ce titre, ils ont grande importance et doivent être connus et reconnus comme importants pour toute personne d'esprit public de la ville et de la campagne. Pareilles assertions ont été faites ailleurs qui révélèrent des conditions similaires. La situation agricole présente au Canada et aux Etats-Unis une similitude surprenante. Il y plus de ressemblance que de contraste entre nos produits et nos problèmes commerciaux. Les ruraux canadiens et américaines ont plusieurs traits de ressemblance qui se découvrent dans leur caractère, leur mode de vie, leur méthode de travail. Ces deux pays subissent une dépression agricole provenant, dans les deux cas, de la baisse rapide des prix des produits agricoles, en 1920, baisse concomitante avec une augmentation des prix de la plupart des articles requis pour la production agricole de même que des divers services sociaux.

Au mois de décembre dernier, j'avais l'avantage d'assister à une conférence sur la coopération commerciale à Washington. A la dernière séance, le vice-président, M. Carl Williams, rappela que cette conférence constituait la plus importante assemblée jamais tenue aux Etats-Unis dans l'intérêt de l'agriculture. Parmi les faits les plus impressionnants de cette impressionnante assemblée, les suivants furent les plus saillants:

Le mouvement coopératif agricole fut proclamé et généralement accepté comme un

mouvement d'intérêt public et non pas seulement pour le bien du cultivateur.

Comme conséquence de cette opinion, qui prévalut généralement, l'industrie, les intérêts gouvernementaux et financiers furent représentés à la conférence par des figures éminentes dans les affaires américaines.

Ces représentants approuvèrent et endossèrent, sans une seule exception, le mouvement coopératif.

Bien que la nation américaine soit hautement industrialisée, son agriculture fut néamoins proclamée l'industrie fondamentale.

D'un commun accord, cultivateurs et financiers admirent que l'agriculture aux Etats-Unis est présentement dans un état de détresse et qu'il fallait lui appliquer des remèdes radicaux pour la ramener à la place qu'elle doit occuper dans l'économie nationale bien entendue.

Enfin les organisations coopératives pour la vente des produits agricoles furent considérées comme le meilleur, sinon l'unique, remède à la dépression agricole présente.

Voici maintenant quelques-unes des observations présentées par les conférenciers, parmi lesquels on remarque le juge Bingham, propriétaire du Courrier-Journal de Louisville, et président de la conférence, Herbert Hoover, Eugène Meyer, président de la corporation financière de la guerre, M. Allan, président de l'Association des Banquiers, le sénateur Capper, l'un des premiers promoteurs du Bloc agraire et M. Wallace, secrétaire de l'agriculture dans l'administration Harding:

"En 1922, le pouvoir d'achat des produits de la ferme n'était que 70% de ce qu'il était en 1913."

"La nation ne doit pas prétendre se procurer sa nourriture à des prix inférieurs au coût de production."

"Le cultivateur a souffert plus que toute autre classe. Il a droit de se plaindre. Il a droit de demander du soulagement."

"A moins que nous ne consentions à courir à notre perdition à une allure dépassant celle à laquelle Babylone et Rome se précipitèrent vers la ruine par l'appauvrissement de leur agriculture, il nous faut réagir dès maintenant."

"Nous sommes sortis de la période où le cultivateur pouvait compter sur l'augmentation en valeur de sa terre pour montrer des profits; les profits, s'il doit y en avoir, doivent provenir de saines méthodes de production et de vente."

L'on pourrait dire, et on le dit du reste souvent, que si les cultivateurs ne sont pas satisfaits de leurs revenus et de leurs conditions de vie, ils n'ont qu'à changer d'occupation. C'est précisément ce que, dans l'intérêt public, ils ne doivent pas faire. Le cultivateur peut toujours s'arracher à une situation intolérable ou intenable en quittant sa ferme; la migration rurale vers les villes qui cause tant d'alarme chez les citadens en fait foi. Mais le peuple, lui, ne sait pas se soustraire aussi facilement aux conséquences qui résultent de l'abandon de la terre par le cultivateur. Le bien public ne peut pas s'accommoder du départ de ces derniers et de la venue de cultivateurs européens ou de cultivateurs peu expérimentés ou sans expérience pour remplacer le canadien ou son fils qui possèdent déjà un long entraînement.

L'on trouve dans cet émouvant récit canadien-français au cours duquel une fille du peuple, "Maria Chapdelaine," aux prises avec la tentation de se soustraire aux misères de la vie de colon dans le nord du Québec et de saisir une occasion qui lui est offerte d'aller jouir de la vie facile d'une ville américaine, entend l'appel de sa province natale qui la supplie de rester avec les siens, le passage frappant que voici:

"Car en vérité tout ce qui fait l'âme de la province tenait dans cette voix: la solennité chère du vieux culte, la douceur de la vieille langue jalousement gardée, la splendeur et la force barbare du pays neuf où une racine ancienne a retrouvé son adolescence.

"Elle disait:

"Nous sommes venus il y a trois cents ans, et nous sommes restés... Ceux qui nous ont menés ici pourraient revenir parmi nous sans amertume et sans chagrin, car s'il est vrai que nous n'ayons guère appris, assurément nous n'avons rien oublié.

"Nous avions apporté d'outre-mer nos prières et nos chansons: elles sont toujours les mêmes. Nous avions apporté dans nos poitrines le coeur des hommes de notre pays, vaillant et vif, aussi prompt à la pitié qu'au rire, le coeur le plus humain de tous les coeurs humains: il n'a pas changé. Nous avons marqué un plan du continent nouveau, de Gaspé à Montréal, de Saint-Jean-d'Iberville à l'Ungava, en disant: Ici toutes les choses que nous avons apportées avec nous, notre

culte, notre langue, nos vertus et jusqu'à nos faiblesses deviennent des choses sacrées, intangibles et qui devront demeurer jusqu'à la fin.

"Autour de nous des étrangers sont venus, qu'il nous plaît d'appeler des barbares; ils ont pris presque tout le pouvoir; ils ont acquis presque tout l'argent; mais au pays de Québec rien n'a changé. Rien ne changera, parce que nous sommes un témoignage. De nous-mêmes et de nos destinées, nous n'avons compris clairement que ce devoir-là: persister... nous maintenir... Et nous nous sommes maintenus, peut-être afin que dans plusieurs siècles encore le monde se tourne vers nous et dise: Ces gens sont d'une race qui ne sait pas mourir... Nous sommes un témoignage.

"C'est pourquoi il faut rester dans la province où nos pères sont restés, et vivre comme ils ont vécu, pour obéir au commandement inexprimé qui s'est formé dans leurs coeurs, qui a passé dans les nôtres et que nous devrons transmettre à notre tour à de nombreux enfants: Au pays de Québec rien ne doit mourir et rien ne doit changer.. "

L'on prête à la population rurale du Québec l'idéal suivant: "De nous-mêmes et de nos destinées, nous n'avons compris clairement que ce devoir là: persister... nous maintenir... Et nous nous sommes maintenus."

J'aime à croire que ces paroles furent dictées par la sincérité et écrites dans un noble but. Mais, considérons les faits. De 1911 à 1921, la population de la Colombie-Anglaise augmenta de 88,000 âmes; celle de l'Alberta, de 129,000; de la Saskatchewan, de 177,550, du Manitoba de 87,500, de l'Ontario, de 27,600. Durant la même période, la population rurale du Québec perdit toute son augmentation naturelle et plus, puisqu'elle accuse un déficit de 304.

Le Québec rural a une population, pour ainsi dire, parfaitement solidaire: elle est de même race, parle la même langue et professe la même réligion. Son augmentation naturelle dépasse de beaucoup celle des autres provinces. Son église et son clergé possèdent un prestige et une autorité non équivoque. Le clergé et l'église ont déclaré, si nous sommes bien renseignés, que par devoir et par vocation, le peuple de la province devait se cramponner au sol, conserver la terre et la considérer comme un trésor sacré, héritage transmis à eux par leurs ancêtres pendant trois siècles.

Si ces gens rattachés au sol de leur province natale par le lien de souvenirs anciens si chers; si ces gens ainsi avisés et dirigés n'ont cependent pas su conserver leur terre et s'ils ont abandonné l'héritage de leurs ancêtres, comment devons-nous étonner du départ des éléments ruraux plus aventuriers des autres provinces; aussi ces éléments aux traditions plus nouvelles, guidés par des conseils moins uniformes, cherchent-ils des prairies fraîches et des pâturages nouveaux!

Ce n'est pas dans l'existence d'une population rurale satisfaite, mais sans espérance et aux visions bornées par la clôture de la ferme, même s'il était possible de concevoir une telle paysannerie, et ce n'est pas possible, que réside le remède. Le monde des opportunités est trop proche et d'accès trop facile. Et la loi de l'offre et de la demande; la loi de l'offre des opportunités et de la demande de liberté agit ici comme ailleurs.

Où est le remède? Non pas dans le retour aux méthodes de culture primitives par une classe de paysans primitifs, mais bien dans une agriculture plus perfectionnée, dans une organisation du commerce des produits agricoles plus direct et présentant moins d'occasions de pertes, dans des avantages plus alléchants qu'offrirait la campagne. Toutes ces conditions doivent être considérées, non pas principalement du point de vue du cultivateur ou de ses intérêts, mais du point de vue du bien public.

Certains services publics doivent être dirigés vers la conservation du meilleur type de cultivateur, et cela dans l'intérêt public, le cultivateur pris individuellement ne pouvant pas atteindre ce but. Il faut donc faciliter la possession de la terre par le cultivateur, car un propriétaire vaut mieux, dans l'intérêt public, qu'un locataire; établir une loi d'affermage qui permettra au locataire d'améliorer la ferme qu'il occupe; poursuivre des recherches scientifiques afin de protéger l'agriculture contre les ennemis naturels: plantes adventices, insectes, maladies dégénérescence se produisant chez les espèces végétales et animales améliorées; délivrer le cultivateur de la tyrannie et des caprices du marché jusqu'à la limite où les autres classes de producteurs en sont délivrés; permettre au cultivateur de soutenir,

à termes égaux, la compétition avec les services publics et les autres entreprises privées pour l'obtention de la main-d'oeuvre; lui permettre d'instruire ses enfants sans être obligé de les envoyer loin du foyer paternel, quand ils sont encore à un âge tendre; aider aux organisations sociales qui permettront au cultivateur et à sa famille de jouir d'une vie sociale et intellectuelle, satisfaisante.

Je le répète avec toute l'emphase dont je suis capable: l'argument de fond, c'est que la conservation des ressources naturelles du domaine public, la production de la nourriture et le caractère et les conditions de vie de ceux qui vivent à la campagne, concernent le public plus que le cultivateur lui-même.

Pour le bien public, il faut conserver au sol toute sa fertilité. L'histoire de l'agriculture nous apprend que lorsque les cultivateurs sont laissés à leurs propres ressources, leurs méthodes de culture amènent, sous la pression des conditions économiques ordinaires, une diminution constante de la fertilité du sol. L'on a observé dans la Nouvelle-Angleterre et dans certaines parties de l'Est du Canada que la terre s'épuisait, il y a une cinquantaine d'années. Même le sol des prairies de l'Ouest que l'on croyait inépuisables, est devenu, au dire des cultivateurs des vieilles sections, moins fertile qu' autrefois. Seule une bonne culture peut maintenir la fertilité du sol et l'empêcher de s'appauvrir. Le bon cultivateur a donc une double tâche: la première, qui est d'ordre personnel, c'est de tirer sa vie de la terre; la seconde, qui est d'intérêt public, c'est de conserver la fertilité naturelle du sol. Lorsque le cultivateur possède en propre la terre, l'intérêt public marche de pair avec l'intéret privé. Le système d'affermage qui prévaut au Canada et qui est opposé à la propriété privée incite à un système de culture épuisant pour le sol. Les terres se louent généralement à une rente annuelle fixe ou encore pour une proportion déterminée des récoltes. Le fermier n'a aucune assurance qu'il bénéficiera d'une partie de la valeur des améliorations qu'il aura faites lui-même. Le spéculateur des terres de l'Ouest, qui les achète dans le but de les revendre aussitôt qu'il pourra trouver un profit satisfaisant, ne veut pas louer ses terres à long terme. Il préfère les louer d'une année à l'autre. Dans ces conditions, le fermier considère qu'il est de son intérêt de tirer tous ce qu'il peut de la terre et de lui donner le moins possible sous forme de travail ou d'engrais. Même les propriétaires de fermes ne conservent pas la fertilité de leur sol s'ils ne sont pas bons cultivateurs, satisfaits de leur vie et des conditions de leur milieu. Le bien public exige que les travaux des collèges d'agriculture, des stations d'expérimentation, soient poursuivis et augmentés. Le développement de l'agriculture consiste dans la sélection de certaines plantes et de certains animaux domestiques et dans l'amélioration constante des espèces choisies par une sélection plus soignée et par un élevage plus rationel. La sélection humaine et la sélection naturelle ne s'opèrent pas de la même manière et elles ne tendent pas à la même fin. De sorte que la nature a developpé une sorte d'hostilité contre l'amélioration artificielle des plantes et des animaux. La loi physique de la déperdition de l'énergie ou quelque chose d'analogue en biologie tend a réagir contre l'amélioration des espèces résultant de la sélection faite par l'homme et contre les plans artificielles de croisement. Les produits provenant des station où se pratique la sélection sont remis entre les mains des cultivateurs; mais à moins que ces derniers n'exercent le même soin et n'appliquent la même science qui ont présidé à la production de ces sujets d'élites, la dégénérescence apparaît très rapidement. Plus les effets de la sélection humaine sont marquants dans les produits de la ferme, plus il faut de science et de soin pour maintenir la qualité de ses produits. C'est la sélection humaine qui a fait naître le problème des mauvaises herbes et des insectes. Laissé à lui même, le cultivateur ne peut pas découvrir les caractéristiques et les habitudes de ses ennemis naturels. Dans tous les pays où l'agriculture s'est imposée à l'attention publique, les gouvernements ont assumé la responsabilité d'établir des stations de recherches et d'expérimentation où ils poursuivent des recherches sur les maladies des animaux et des plantes, sur l'amélioration des récoltes et des animaux et sur l'éradication et les moyens de contrôle des mauvaises herbes et des insectes nuisibles. L'augmentation en valeur de trois des principales récoltes de grains dans l'Ontario,—blé d'automne, avoine et orge—au cours des vingt dernières années, s'est élevée, par l'augmentation de la produc-

tion à l'âcre, à $134,667,000. Cette augmentation provient soit de l'amélioration des méthodes de culture ou de l'emploi de variétés de grains améliorés. Aux collèges et aux stations expérimentales revient une bonne partie du crédit de cette augmentation énorme des richesses nationales, qu'elle soit due à une meilleure culture ou à des meilleures variétés de grain, et ils ont donc travaillé dans l'intérêt public. C'est encore dans l'intérêt public que les gouvernements ont établi les lois réglant le contrôle des plantes adventistes, des insectes nuisibles, des maladies infectieuses affectant les animaux, et qu'ils ont nommé des officiers chargés de l'application de ces lois. Le pays ne peut pas en effet laisser détruire le travail du bon cultivateur par la négligence et l'indifférence de ses voisins.

Dans l'intérêt public, il faut également que les découvertes des stations expérimentales soient portées à la connaissance de tous les cultivateurs, des indifférents comme des plus zélés, le plus tôt possible. C'est à cette fin que fut établi le système des agronomes de district, parce que l'on a découvert que les énormes frais d'entretien et d'expérimentation des stations agricoles de même que leurs importantes découvertes ne produisaient pas des résultats adéquats. Le cultivateur intéressé avait bien appris à s'adresser aux collèges et aux stations expérimentales pour obtenir les informations dont il avait besoin; il avait bien pris l'habitude d'employer des nouvelles variétés; il avait bien adopté les nouveaux systèmes de culture et les nouvelles méthodes de contrôle de ses ennemis naturels. Mais le cultivateur indifférent ne semblait pas susceptible d'adopter le système de la correspondance. Il devint donc nécessaire d'adopter comme principe de mettre à la disposition de chaque cultivateur, les connaissances nouvelles, plutôt que de se fier à l'intérêt que créerait chez lui ces connaissances pour l'engager à se les approprier. L'agronome de district est donc allé à la rencontre des cultivateurs des régions éloignées comme des régions plus accessibles.

Il est de l'intérêt public que le plus grand nombre possible de cultivateurs provoyants reçoivent des instructions détaillées et définies sur les principes de l'agriculture scientifique, sur le commerce des produits agricoles, sur l'économie rurale et sur les oeuvres sociales. Les écoles et les collèges d'agriculture doivent enseigner à leurs élèves les principes sur lesquels repose l'amélioration des plantes et des animaux domestiques, afin que, dans l'application de leurs connaissances dans les travaux de la ferme, ils puissent maintenir la qualité des produits. Les écoles et les collèges doivent encore enseigner la manière de maintenir la fertilité du sol en même temps que les obligations qui incombent à tout bon citoyen, afin d'assurer la conservation dans toute son intégrité du domaine public. Ils doivent encore enseigner les effets désastreux qui résultent de l'application de méthodes douteuses pour la manipulation des récoltes et le soin des bestiaux et des vergers et ajouter à cela des leçons concernant les méthodes de contrôle des mauvaises herbes, des insectes et des maladies, afin qu'ils puissent faire produire à la terre toute la richesse qu'elle est susceptible de produire et qu'ils évitent de convertir leur ferme en un lieu d'infection qui deviendrait une menace publique. Les collèges et les écoles doivent encore attirer l'attention de leurs élèves sur les besoins de la société rurale, leur enseigner les principes qui conduiront à l'amélioration des conditions de vie à la campagne, de manière à ce que les jeunes cultivateurs puissent plus tard donner une direction bienfaisante dans les millieux qu'ils habiteront. Ils doivent encore enseigner tout ce qui concerne la vente des produits de la ferme, la finance et la coopération de manière à pouvoir se rendre le témoignage qu'ils ont obtenu en retour des argents dépensés, du travail et de l'intelligence consacrés à l'enseignement, une compensation équitable.

Concerning the C.S.T.A.

Owing to lack of space in this issue, we are obliged to omit a number of items which were to appear in this section. The October issue will therefore feature some of the major activities of the Society.

The General Secretary has just completed a hurried visit to the local branches in the Maritime provinces. Reports of these meetings, with group photographs, will appear next month. Notes of progress from other locals will also be published.

A meeting of the Dominion Executive Council is being held at Ottawa during the week of September 10th, and the decisions reached at that meeting, especially with regard to some of the resolutions passed at Saskatoon, will be of special interest to members of the Society.

The October issue will therefore feature the following:—

1. Activities of local branches.
2. Report of Executive Council Meeting.
3. Progress of standing committees' work.
4. Outline of proposed society activities for the coming winter.

The usual number of articles will also appear.

NOTES.

W. A. Maw (Macdonald, 1920) has been appointed head of the Poultry Department at Macdonald College, succeeding Dr. M. A. Jull, who recently was appointed Chief of the Poultry Division at Washington.

Miss M. J. Mounce (British Columbia, 1921), was married on August 7th to Mr. Howard C. Green of Kaslo, B.C. Miss Mounce had been with the Bacteriology Departme of the University of British Columbia f the past two years.

R. Schafheitlin (Macdonald, 1916) is no manager of the Canard Fruit Company Canning, N.S.

H. F. Williamson (Macdonald, 1915) h recently accepted a new position at the Mas achusetts Agricultural College, Amherst. H was formerly at Farmingdale, Long Islan

The following members of the C.S.T.A are planning to take post graduate work Macdonald College during the coming winte

H. S. Cunningham, Truro, N.S.

B. F. Tinney, Charlottetown, P.E.I.

F. Laughland, Winnipeg, Man.

W. A. DeLong, Truro, N.S.

APPLICATIONS FOR MEMBERHIP.

George Danby, Dept. of Agriculture, Frede icton, N.B. (Associate).

M. L. McAloney (Miss), (McGill, 1921, B S.A.) Fairview, N.S.

D. A. MacIsaac (Toronto, 1911, B. V. Sc Antigonish, N.S.

A. Marseille (*) Berthier, P.Q.

J. G. Morgan, Exp. Farm, Fredericton, N.B (Associate).

F. W. Walsh (Toronto, 1922, B.S.A.) Trur N.S.

E. A. Western (Toronto, 1921, B.S.A.) Po Arthur, Ont.

*Details regarding this applicant, as t University, year and degree, have not bee received.